Case Study: *Onsite Wastewater Management* in *Willard, New Mexico*

Achieving Centralized Management of a Decentralized System in a New Mexico Village

Prepared for

National Onsite Demonstration Program
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by

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Putting Words to Work
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Note to the Reader

This case study is intended to help communities that want to better manage wastewater, by recounting Willard's experience and lessons learned from it. Toward this end, not all information is presented in strict chronological sequence. Rather, some is organized around key topics that warrant special focus.

Appendixes supplement and, for ready reference, consolidate some information in the body of the text. They are presented not in the order in which they are cited in the text but in the order that may be most useful to readers.

Summary

The New Mexico Environment Department helps communities protect drinking water and safely manage wastewater. In 1999 the U.S. Environmental Protection Agency (EPA) made available to the state a hardship grant for a wastewater-management project. To simplify administrative requirements and leverage impact, the state chose to devote the entire grant to one community.

The community that stepped forward to ask for help was Willard, a small village approximately 70 miles southeast of Albuquerque in a semiarid environment in which water is a scarce resource. The village government operates a drinking water system that draws water from a well in the center of town, but each household was responsible for managing its own wastewater. Willard's mayor knew from observation that many homes around the well probably lacked adequate septic tanks. Indeed, this proved to be the case: 40 of the approximately 100 properties in the village did lack adequate septic tanks, and some properties had only cesspools, some of which were producing visible surface contamination. Data from well-water sampling suggested the mayor's concerns were well-founded: levels of nitrates were rising, and the nitrogen in human waste was the likeliest source.

The mayor initially asked the state for $50,000 to install 40 septic tanks. But the state proposed a project that could demonstrate the benefits of centralized management of affordable, decentralized wastewater systems. An employee of the state Construction Programs Bureau had long been committed to this concept as an alternative to costly central sewer systems. He knew that being able to point to a community that had successfully adopted such a system would be a powerful outreach tool. Along with a Financial Manager in his bureau, he became instrumental in helping Willard obtain the EPA grant, a state construction loan, and other funding. He and other parties also helped village officials and staff take the many technical, legal, and administrative steps necessary to transform the ad-hoc way in which wastewater had been managed by residents into a village-administered wastewater management utility. That utility is in a very real sense an extension of the drinking water utility that the village already operates. And why not? It is basically the same water entering and leaving people's homes, and the water that leaves can affect the quality of the water that enters.

Some steps in the project have presented challenges. The most severe was opposition among some residents to incurring the costs of repaying the state construction loan and of paying for operation and maintenance of the wastewater system. This opposition was understandable: Willard is a low-income community; many residents are retired and living on small fixed incomes; those who work tend to have low incomes too. The village's investment in a new drinking water system in the mid-1990s had already raised monthly water bills, and the gas company had just raised its rates. Even small increases in bills were keenly felt. Indeed, initially not all council members supported the project.

Thus, public education and involvement became critical to success. The project was discussed at many public meetings over several years, and residents were informed of the meetings, and about the project, through widely distributed flyers and bulletins, and through messages on water bills. State employees, the project engineer, and other resource people attended meetings to provide information and answer residents' questions. Tabletop models of filtration systems helped build understanding. Some residents stepped forward to help with crucial tasks—notably, selecting an engineering firm and conducting a house-to-house survey to determine baseline conditions. Their participation not only helped advance the project; it signaled local support. Particularly during the early stages of the project, those residents who attended meetings and voiced support helped create the conditions that moved the project forward. While their role was not highly visible, it was highly valuable.

In all, the village's efforts were a model of open government that informs and strives to involve the public.

The former mayor, who launched the project and worked to advance it, observes that perhaps most valuable were informal one-on-one discussions with residents. Unless you talk directly with people to understand the source of their opposition, he cautions, you can't effectively address their concerns. The current mayor, formerly a councilman, notes that his own initial resistance was overcome as he grew to appreciate the long-term benefits the project would bring the village. His resistance is easy to understand and was shared by some other residents: he had paid to install a septic tank when he first moved to Willard; when he later moved within Willard he paid to install another. He did not want to pay for other residents' systems too. And he was reluctant to impose another expense on constituents with fixed incomes.

To overcome resistance to cost, two basic points had to be made clear: (1) All residents would benefit from protecting the common source of drinking water; (2) all households would benefit from having the village government take responsibility for inspecting, maintaining, repairing, and pumping their septic tanks. And because these costs would be shared, they would be less than what each household would have to pay for these services on its own. When relatively late in the project a petition signed by twenty-five citizens protesting it was presented to the village council, the council stood its ground. Pointing to the many meetings at which the project had been discussed and the steps already taken to implement it, the council voted to proceed.

The current mayor and council support the project, and it *is* proceeding, in two phases, because initial funding could not cover all costs. The most urgent problems have been tackled first. In the areas near the village well, the technical solution links conventional septic tanks to recirculating textile media filters, a technology that provides a higher level of treatment. Three filter systems and adjacent leachfields, all located beyond the zone closest to the village well, will each serve approximately 20 homes. In areas more distant from the well, septic tanks and leachfields will be installed at each home where needed. Phase I construction should be complete by mid-February 2003, and the village is taking the administrative and legal steps required to begin operating the Phase I portion of the system at that time. Funding is still being sought for Phase II construction, which could be completed within 6 months. Total project costs to Willard, independent of operations and maintenance, are estimated to be $1,085,900.

The Willard project is a first of its kind in New Mexico, and while its funding arrangements cannot be exactly replicated, its experience illuminates many challenges that many communities may face. In New Mexico, in which both water and money are scarce, the direct link between sound wastewater management and protection of drinking water is clear and the need for affordable wastewater management systems is pressing. The stakes for communities in need are high: protecting drinking water for current and future generations, protecting property values, attracting new residents, and investing in the infrastructure essential to attracting economic development.

Governor Bill Richardson made water issues a top priority in his 2002 campaign, and he has clearly and repeatedly signaled that they are a top priority of his administration. It seems likely that his administration will want to tell Willard's story widely, so that what has been learned from it can help other communities achieve successes of their own.

Sources of Information for This Case Study

A principal source of information for this case study was a community guide based on the Willard project that was prepared by the New Mexico Environment Department with funding from the U.S. Environmental Protection Agency (EPA). Titled *A Simpler, Cheaper Alternative to Sewer Systems: Centralized Management of Decentralized Wastewater Systems*, it is a comprehensive document with extensive appendixes, designed to help other communities benefit from Willard's experience. The guide and other useful information can be found on a web site: www.sewerless-wastewater-solutions.org

But the guide reflects Willard's progress only through March 2002. This case study also draws from recent interviews with individuals associated with Willard's project, who not only updated information in the guide but provided a fuller account of some aspects of Willard's story:

- *Construction Programs Bureau of the New Mexico Environment Department*: (1) Richard Rose, now Bureau Chief, who as a Bureau engineer was instrumental in launching the project and moving it forward. In this case study he is termed the "state facilitator." (2) Ramona Rael, the Bureau's Financial Manager, who was instrumental in helping the village obtain funding.

- *Willard officials*: (1) Former Mayor Louis Perea, who initiated the project in 1999 and moved it forward until he left office at the end of 2001. (2) Alphonso Valdez, former councilman and Mayor Pro Tem, who became mayor in March 2002. (3) Gayle Jones, who became full-time clerk-treasurer in January 2001 and who handles financial and administrative matters. (4) Joyce Garcia, who joined the village staff in February 2000, has held several positions, and is now full-time assistant clerk.

- *Engineering services*: Dennis Wagner of Engineers Inc., Silver City, New Mexico, who has provided essential technical services. The engineering report prepared by his firm served as another source for this case study.

- *Construction services*: Darryl Pettis, who is President of Yellow Horse Corporation, Magdalena, New Mexico, the firm that constructed Phase I of the project.

- *Rural Community Assistance Corporation*: Karen McBride, who managed the survey of baseline conditions.

Description of Environment and Community

Location and environment

Willard is located in a rural area of Torrance County, approximately 70 miles southeast of Albuquerque, at an elevation of approximately 6,000 feet. Occupying approximately 130 acres, the village is flat, with a slight grade to the southeast. The region is characterized as semiarid high desert. Surface water in Willard is limited to water runoff from storms. Mountains to the west intercept precipitation, and rainfall averages 12 and ½ inches a year.

Like most New Mexico communities, Willard obtains its drinking water from groundwater. The principal aquifer lies beneath the ancient lake valley in which Willard sits. The soil profile of the valley fill varies by depth, and strata of sand, gravel, silt, and clay reach depths of 300 feet. Some strata are fine-grained and of low permeability, while others consist of coarser sediments with higher permeability. Together, they form numerous water-bearing beds. These layers of varied permeability control groundwater flow vertically through strata at varying depths.

Together, the characteristics of the climate, the structure of the aquifer, and composition of the soil aggravate the effects of groundwater pollution. Rainfall is limited to begin with, and low permeability of the soil limits recharge of the aquifer by rainfall. The low permeability of confining strata limits absorption of contaminants migrating toward the aquifer, but contaminants may spread rapidly once they reach a layer of high permeability. Low precipitation limits dilution of contaminants, and stratification of the lake bed tends to concentrate contaminants. Stratification also complicates interpretation of water samples: samples drawn from an unstratified aquifer can be assumed to be representative of the whole; those drawn from a stratified aquifer cannot.

Thus, not only is water in short supply; the physical setting offers little forgiveness for polluting it.

Recent history and population

Modern-day Willard was created by homesteaders and the expansion of the railroad. The village was founded in 1902, along the Atchkinson, Topeka & Santa Fe Railroad (now the Burlington Northern Santa Fe Railway), and it became a rail shipping port for local ranchers and farmers. It was incorporated in 1910.

Willard grew as a rail shipping port for ranchers and bean farmers. Population peaked in 1930 at 482 people, but shrank with curtailment of railroad operations during the 1950s through ‘70s. By 1980, the village had less than half its peak population. But the population has since grown. Reasons cited are migration to the Sunbelt, particularly by retirees, and growth in the local dairy industry. The 1990 census recorded 183 residents; the 2000 census recorded 240, of whom over 83 percent were Hispanic. It is estimated that by the year 2020 the population may range from 234 to 394 people.

Data on median household income for 2000 are not yet available, but it is known that many residents have small incomes. For 1990 the figure was $15,417, with 12 percent of households then below the poverty line and approximately 25 percent of the population over 65.

Land use and economy

Land use within the village is primarily residential and agricultural. Most residences are single-family homes constructed on site, mobile homes, and manufactured housing, and most are within a 50-acre area. The village has no zoning ordinances. All streets, with one exception, are unpaved. In the center of the village are the Village Hall, a post office, and a community center. Nearby are two churches, a gas station, a senior center, a volunteer fire station, and a cantina. Children are bused to schools in nearby towns. The Burlington Northern & Santa Fe Railway traverses the village, but trains no longer stop there. The village has no industry and little economic base. Farming and ranching are the primary sources of income in the area. A large dairy is located 1 and ½ miles away.

Local government

Under New Mexico law, villages have the same powers as other forms of local government. Willard’s elected officials include a part-time mayor and four-member council; they are essentially unpaid, receiving only small stipends. Official business is transacted at monthly council meetings; the mayor votes if there is a tie.

Village staff functions have evolved over the past several years, and staff has turned over several times. Employees now include a full-time clerk-treasurer, a full-time assistant clerk, a part-time bookkeeper, and an employee who operates the village drinking-water-system and will operate the wastewater system.

Past Wastewater Management Practices and Origins of Project

Where Willard's drinking water comes from

Drinking water comes from a community well in the center of the village that was constructed in 1971. The village government operates the drinking water system, and it constructed a new system in 1994. The system has 102 water-user accounts, almost all of them households. Some private wells are still active, too.

Drill logs from the 1970s indicate that water levels then were 40 feet beneath ground surface. Logs for wells drilled in the 1990s indicate that the water level had dropped to 80 to 90 feet. The fact that water is being removed faster than it is being replaced serves as a reminder that water is scarce.

Where Willard's wastewater was going

Like many communities, Willard constructed its drinking water system without regard to how to manage that same water *after* it is used in each home. The village well was sited in the center of town, to minimize the amount of pipe that had to be laid to each home and thus limit construction costs. But with most water users concentrated within a 50-acre area around the well, this economy had the effect of concentrating wastewater in that same area. Of the over 20,000 gallons of wastewater that Willard's households together discharge each day, approximately 40 percent was filtering through soil within the 885-foot radius of the well. Groundwater depth in different water-bearing strata in the area ranges from 50 to approximately 150 feet; the village well is 170 feet deep, and water is drawn from the aquifer at depths ranging from 90 to 160 feet.

As most of Willard's water-user accounts are households, most of its wastewater is generated by households; it has no significant commercial, industrial, or agricultural wastewater flows. Wastewater treatment and disposal took the form of individual onsite systems: septic tanks, leachfields, holding tanks, and cesspools. Each household was responsible for its own system.

State regulations require that onsite systems be installed on no less than three-quarters of an acre, and the state requires that property owners obtain state permits to install onsite systems. But most of the village was platted long before those regulations were adopted.

Wastewater becomes a public issue

Louis Perea moved to Willard in 1996. Within 2 years after he purchased the village cantina, he had to install a complete new septic system. He assumed other properties might have similar needs that were going unaddressed. Indeed, some properties had cesspools, and surface contamination was visible in some yards near the well. When Louis became a member of the village council, he began to think about the problem from a village perspective. In 1999, he became mayor, and when the village clerk informed him that the state had announced the availability of funding for wastewater projects, he decided to seek help, and, if a project appeared feasible, to propose it to the village council. In March 1999 he approached the state Construction Programs Bureau with a request for a $50,000 loan to install 40 septic tanks.

Sampling data provided by the state indicated that the mayor's concerns were well-founded. As required by state regulations, Willard samples its drinking water monthly for coliform bacteria; the state samples it annually for certain organics, inorganics, and other contaminants. While the quality of Willard's groundwater had been considered good, samples taken from the village well from 1995 to 1997 showed a five-fold increase in nitrate levels. If this trend continued, levels could soon exceed regulatory limits. Federal regulations under the Safe Drinking Water Act define 10 milligrams of nitrate per liter as the limit for safe drinking water. Nitrate levels in excess of 5 milligrams per liter pose particular risks to infants and nursing mothers (the “blue-baby” syndrome) and trigger requirements that warning notices be published and the frequency of sampling be increased. Background levels of nitrates in the area around Willard are less than 1 milligram per liter; nitrate levels in samples taken from the well just north of Willard that supplies water to nearby Mountainair were 0.2 to 0.3 milligrams per liter. Nitrate levels in Willard’s well water were as much as nearly ten times higher.

Making decisions in the face of uncertainty

The subject of sampling warrants careful consideration. Severe limitations of sampling data from household wells left Willard largely dependent on state Drinking Water Bureau data based on samples taken from the village well. That data went back 6 years, but because the state conducts sampling only once a year, this constituted a small number. Waiting to acquire more annual samples could permit the level of contamination to rise. Alternatively, the cost of drilling monitoring wells and conducting extensive groundwater studies to try to more fully characterize the nature and extent of the problem was far beyond Willard’s budget.

But even spending more time and money could not guarantee significantly more reliable data, because sampling can yield data that are ambiguous and even conflicting, and samples taken at the same time in nearby locations can differ markedly because of variation from site to site. In Willard, contaminant levels often exhibit marked seasonal variations, depending on varying flow from higher gradients when the dairy south of Willard pumps its wells for irrigation. The non-uniform character of Willard’s aquifer and overlying soil strata make the source of contamination difficult to isolate. Further ambiguity is inherent in laboratory analysis: splitting a single sample and sending the splits to two different laboratories can produce different results.

Thus, sampling alone cannot be relied on to determine the severity and trend of wastewater problems, and indeed acquiring more data could raise more questions and delay needed action. Sampling data must be viewed as significant indicators to be assessed within the larger context of a specific physical setting and its history. For Willard, that context included these factors:

- Most sampling data acquired over recent years did indicate elevated levels of nitrates in Willard’s drinking water. While industrial and agricultural processes can produce nitrates, no industry is present in Willard. Moreover, prevailing groundwater flow gradients due to irrigation pumping south of the village and local topography prevent nitrates from the nearby dairy farm from migrating north to the source of village well water. Water samples taken from the well that serves nearby Mountainair did not show elevated levels of nitrates.

- The village well is located in the center of town, with about 40 homes within 885 feet of the village well and most homes within a 50-acre area. Approximately 40 of the village’s 102 water-system users were believed to lack septic tanks, of the tanks known to exist, some were not in good condition.

- Household wells close to onsite systems and cesspools provided a potential conduit through which wastewater could migrate to the shallow strata of the aquifer. And indeed those strata are already badly contaminated. Contamination could migrate deeper, to the strata Willard taps for drinking water.

- The fact that the only source of nitrogen in the village is human waste made the link between human waste and drinking water clear. (That human waste can also contain disease pathogens, residues of medications, and other chemicals lent further urgency to the problem.)

Given the physical conditions that had prevailed in the village for generations, how could contamination *not* be a problem, and one that would worsen? But would residents be willing to pay for the solution to this problem? For some time the answer to that crucial question would also be characterized by uncertainty.

Launching the Project

The New Mexico Environment Department helps communities protect their drinking water and safely manage wastewater. On the staff of the department's Construction Programs Bureau was an engineer named Richard Rose. Rich was keenly aware of problems posed by inadequate wastewater management in small New Mexico communities, and he had been working to promote centralized management of decentralized systems as a feasible, cost-effective alternative to costly sewer systems. He knew that being able to point to a community that had successfully adopted such a system would be a powerful outreach tool.

When Mayor Perea approached the Bureau, Rich realized that Willard could be the site of the demonstration project he sought. And he knew of funding that could be tapped: EPA had made available to the state a one-time hardship grant for a wastewater project. To simplify administrative requirements and leverage impact, the state wanted to direct the funding to one community. Willard met the grant criteria. And while the grant required matching funds, Rich believed Willard could obtain them. Rich had also obtained a small EPA grant for a demonstration project to produce model ordinances for managing decentralized systems and a guide communities could use to adopt such systems. He therefore invited Willard to pursue a project in which the state would help arrange funding and would provide technical assistance. Because decisions about the project must and should remain squarely in the hands of village officials and residents, the state would not dictate the nature of the technical solution. But it did require that the village consider adopting a centrally managed decentralized system.

The mayor decided to proceed, but he knew his first challenge would be to obtain the support of village council members, who might understandably be reluctant to pursue a project that entailed any costs to a low-income community. Louis recalls Rich stating, "You have the opportunity to do something that no one else has done," and his responding, "If it hasn't ever been done, it can't be easy." He cautioned that the project would be difficult, and Rich understood this. But both parties were committed. Both would prove instrumental to the project's success.

Goals

While no formal vision statement was articulated, it was clear that the project served these goals:

- For EPA, it would directly further the goals of its Clean Water Action Plan.
- For the state, it would produce (1) a demonstration project and community guide that other communities could learn from, (2) model ordinances that would equip communities with the legal authorities they need to create and operate their systems.
- For the village, it would safeguard drinking-water quality for years to come, while placing responsibility for the system securely in the hands of local authorities. And as the current village clerk-treasurer observes, the village has had a good water system since 1994; it's now putting in place a sound wastewater management system. A lot rides on this investment in infrastructure: not only safeguarding public health, but protecting property values, attracting new residents, and investing in Willard's ability to generate the economic development it badly needs.

Framework for success

Along with local control, other features of the project would be these:

- Collaboration among many partners.

- Financing from multiple sources and technical assistance in obtaining it.
- A sound planning process that meets regulatory requirements and provides for the public involvement that could help earn public acceptance. In particular, residents would have to agree to repay a construction loan and to pay for the costs of operating and maintaining the system.
- A legal framework that equips the village government with the authority to manage the system.
- Procurement of engineering and construction services and the ability to manage them effectively.
- Public education that contributes to public acceptance.
- Perseverance, and the commitment essential to long-term success.

Project partners and their roles

The Willard story is above all a story of resourceful collaboration. The principal parties are identified below and their roles sketched. While this section necessarily overlaps with the following sections, which focus on key features of the project, it can give readers who are considering pursuing similar projects a fuller sense of what their own and other parties' participation might entail.

The indispensable role: project champion

This important role has never been formally assigned; rather, it has been performed by individuals who have stepped forward at crucial junctures to exercise leadership or otherwise advance the project. "Champions" have included the past and present mayors, the state facilitator, and the current village clerk-treasurer. In fact, the role can be played by anyone with time, energy, motivation, and perseverance. Access to resources is a further advantage.

The role of village government

- *The mayor*. Without the former mayor's initiative, the project might never have been launched, and he worked hard to help residents understand its benefits and build support. The current mayor, formerly a councilman and Mayor Pro Tem, is advancing the project, too.
- *Village clerks* have been indispensable to project progress, not only by performing vital administrative functions but by providing their own local knowledge and facilitating communication among project partners and residents. This role is particularly important because the village does not yet have e-mail.
- *The council* has four members who make all decision; the mayor votes only in case of a tie. The council seeks and considers public input and is sensitive to it. While not initially unanimous in supporting the project, over time it has approved all formal steps required to move it forward. These include obtaining funding and contracting for engineering and construction services, approving the technical option recommended by the engineering firm, and acquiring easements. It determined the funding mechanism used to repay the construction loan and the amount of the monthly fee each household pays; it will also determine what fee to collect for maintenance and operations and how to manage operation of the wastewater system over the long-term.

The role of Willard residents

Willard residents held the power to defeat the project. To learn about the project, they attended public meetings. Some residents served on an advisory committee that reviewed engineering proposals and recommended a firm. Some helped conduct a house-to-house survey to gather information about existing wastewater systems, and almost all residents cooperated with the survey and with field verification of survey results. Some made their private wells available for water-quality sampling, and will make them available for monitoring. A few reviewed the preliminary engineering report; some helped the village identify owners of property needed for easements. Not least, the residents who attended public meetings and voiced support, sometimes in the face of opposition, created the conditions that made the project possible.

Note: The role of county government in New Mexico is limited, and Torrance County does not figure in this project.

The role of state government and U.S. EPA

The state Construction Programs Bureau helps communities obtain funding and it provides technical assistance. The Bureau employee who served as state facilitator performed many functions, some unique to the Willard Project because of the nature of its funding sources. The Bureau's Financial Manager skillfully shepherded Willard through a complex funding process. The state Drinking Water Bureau provided a tabletop groundwater exhibit for a public meeting, paid for a house-to-house survey, and paid for nitrate analysis of water samples taken from village wells.

The role of the engineering firm

Engineers Inc.'s role has been far more than narrowly technical. The project engineer has been a principal project partner, providing expertise that has helped village officials and residents better understand the project's technical dimensions. His attendance at public meetings has helped build confidence in the project. Core functions include the following:

- *Planning phase*. The firm prepared a comprehensive engineering report that examined technical options and recommended one. To support that option, it prepared an environmental information document that was subsequently used to support the environmental assessment prepared by the state facilitator.

- *Design phase.* The engineer designed the system, prepared technical specifications for construction bids, and helped the village select a construction firm and write a contract with it. He also helped the village determine what property to acquire for easements.

- *Construction phase.* The firm provides construction management services (detailed further below).

Other key roles

- *The Rural Community Assistance Corporation (RCAC)* provided a crucial bridge loan and managed the surveys that are the basis of the engineer's needs assessment.

- *Consultants* Bridget Chard and Jane Schautz brought expertise in public involvement and creation of wastewater-management districts.

- *A construction company*, Yellow Horse Corporation, constructed Phase I of the system.

Securing Funding and Establishing Legal Authorities

Funding: sources and their requirements

The funding package assembled for Willard was in part shaped by specific conditions associated with federal and state funds.

Core funding: the EPA hardship grant and state construction loan

The state facilitator, Rich Rose, met with Mayor Perea and the village council to help them prepare a preliminary application to get on the priority list for the EPA hardship grant. Once on the list, the village had to meet other requirements:

- match 15 percent of the amount of the grant through a loan from the Clean Water State Revolving Fund
- match 5 percent of the grant using other funds. For Willard this took the form of a special appropriation by the legislature, initiated by the Bureau
- submit a preliminary engineering report that (1) assessed the problem; (2) identified and examined technical options for collecting, treating, and discharging wastewater; (3) estimated the cost of each option; and (4) recommended a preferred option
- submit a companion environmental information document on the impacts of the technical option recommended in the engineering report

The state construction loan had its own set of requirements. To obtain it, Willard would have to

- submit a preliminary engineering report
- demonstrate that it could generate a pure, dedicated revenue stream to repay the loan

And because federal funds were involved, the state would have to prepare an environmental assessment, which would be based on the environmental information document.

The preliminary engineering report and environmental information document would have to be issued in draft form for public comment, as would the environmental assessment later prepared by the state. Public comments would have to be evaluated and the documents revised as appropriate. For the environmental assessment to result in a Finding of No Significant Impact, a public notice would have to be issued and any comments received considered.

Once this process was complete, the grant and loan monies could be made available and the engineer could proceed to prepare plans and specifications for construction.

Catch 22: a bridge loan for engineering services

The engineering report and companion environmental document would have to be prepared by an engineering firm. The depth of analysis required would make this a costly task, and Willard found itself in a Catch 22 situation: it could not afford to pay an engineer to prepare the documents it needed to obtain the funding it needed to pay the engineer. But it could use a bridge loan to pay the engineer, and when the hardship grant was awarded, it could use grant monies to repay the bridge loan.

RCAC agreed to make a short-term loan of approximately $27,000. But it had never executed a bridge loan for a state revolving fund loan, and it soon realized that if, after receiving the engineering report, the village decided *not* to proceed with the project, the village might not apply for the loan that would enable it to repay RCAC. RCAC therefore had to establish its own procedures, and this delayed the engineer's work. Another complication was a requirement for evidence that the village was incorporated. Because the records had been destroyed in a fire in 1912, another source of documentation had to be found.

Willard's need for a bridge loan prompted an important reform. The Construction Programs Bureau realized that other communities would need bridge capabilities too. It therefore proposed revisions to the state statute and regulations that govern the state's Rural Infrastructure Program, so that wastewater projects as well as water projects could be eligible for bridge loans from the state to pay for engineering reports and environmental studies. The revisions were adopted, along with lowered interest rates.

Putting the core package together

Ramona Rael, Financial Manager of the Construction Programs Bureau, helps communities explore funding sources, determine which are most appropriate, and pursue them. She also helps them deal with the inevitable paperwork and otherwise navigate their way through the system. She cautions that not all communities may be able to obtain federal funds and that it's best to examine other options too. She also stresses the importance of understanding and meeting funding deadlines.

Ramona helped Willard qualify for the EPA grant, and she worked with RCAC to facilitate the bridge loan. Because RCAC charges higher interest rates, she helped the village move quickly through the application process for the EPA grant, so grant monies could be used to quickly repay the bridge loan and interest charges could be minimized. For the state revolving fund loan, she helped the village qualify for a lower interest rate: 1 percent—a rate not all communities may qualify for.

At public meetings in Willard, Construction Programs Bureau staff presented information that helped the council and residents understand their options and associated requirements. Ramona helped village staff prepare necessary documents. Bureau staff also helped the village solve a problem posed by the EPA grant and state loan. The village had to submit documents signed by an attorney certifying that the village was a legal entity and had acquired all easements necessary for construction to proceed. But Willard had neither an attorney nor the funds to pay for one, nor could it yet know what easements would be required. Bureau staff arranged for the Municipal League to provide free legal services to the village, and it added contingency language to the grant agreement specifying that funding would be made available once easements were obtained.

Bureau staff worked with the mayor and council and participated in a public meeting to help the village determine how it could best demonstrate that Willard could generate the dedicated revenue to repay the loan. After considerable debate, the council adopted an ordinance authorizing the village to levy a $3 monthly wastewater loan repayment fee on each household. The severe difficulties posed by this crucial step in an economically disadvantaged community are discussed below.

The EPA grant turned out to be for $389,700; the state loan, $63,000; the legislative match, $30,000. The total was $482,700. By March of 2001—almost 2 years after the project had begun—all core agreements had been executed and funding was in place.

Other funding sources

Because total project costs would substantially exceed the core funding package, construction was structured in two phases, and another funding source was tapped for Phase I.

- *New Mexico Finance Authority.* The village clerk-treasurer initiated a successful request through Willard's state representative for a $90,000 grant from the Finance Authority, a quasi-public agency that obtains funding through direct annual requests to the legislature. No match was required.

- *Community Development Block Grant*. For Phase II, Willard applied to the Local Government Division of the state Department of Finance for the maximum from this source: $500,000. It also sought a legislative appropriation for matching funds. The block grant application was denied for the 2003 funding cycle, but Willard intends to reapply, and it is exploring other sources of funding. As Phase II could cost an estimated $513,200, the village will need some additional funding even if its full $500,000 request for a block grant is approved.

Two other funding sources warrant mention, too, although the funds did not go directly to Willard:

- *EPA demonstration grant.* As mentioned above, EPA gave the state $79,000 for a demonstration project to develop an implementation guide and model ordinance that New Mexico communities can use to establish decentralized wastewater-management systems. The state $1,000 match secured the grant, and the state applied it to the Willard project. Some of the funding paid for consulting services provided by experts on public involvement and the creation of onsite systems.

- *State Drinking Water Bureau*. In a unique arrangement, this Bureau gave the Construction Programs Bureau $20,000 to pay RCAC to conduct the household survey of baseline conditions. It wanted to use the survey data as background information for locating sources of contamination, as part of the global positioning system database it is creating for its Wellhead Protection Program. Under other conditions, household surveys can be conducted for far less.

Appendix E summarizes the information in this section for ready reference.

Providing necessary legal authorities

Willard's project rested on a key assumption: that the ad-hoc way in which wastewater had been managed by residents would be transformed into a village-administered wastewater management utility. That utility would in a very real sense be an extension of the drinking water utility that the village already operates. And why not? It is basically the same water entering and leaving people's homes, and the water that leaves can affect the quality of the water that enters.

The system would encompass not just new septic tanks and treatment systems installed in the course of the project, but all systems already in place and added in the future. Residents would have to pay for costs not paid for with grant monies. These assumptions required an examination of legal authorities.

State authorities empower units of government to lay pipe in the street for sewer systems but do not explicitly empower them to "go into the yard" of a homeowner. Moreover, the village government would need the authority to generate revenue to pay for a wastewater system. Thus, a question arose for Willard: Did existing statutory language provide the authorities needed to administer a decentralized wastewater system? Specifically, needed authorities included these:

- obtain easements to gain access to property so construction can proceed
- define performance standards for onsite systems
- if necessary, require an unwilling property owner to accept installation of an onsite system
- impose a fee on each property owner to pay for operating and maintaining the system

- gain access to property so trained personnel can periodically inspect, maintain, and repair the components of the system
- gain access to property to pump septic tanks
- enforce requirements by imposing penalties for noncompliance, such as shutting off water or placing a lien on property
- monitor drinking water wells to determine levels of contaminants
- after construction of the system is complete, require owners building new homes to install—at their own expense—onsite systems that meet state regulations for waste disposal and Willard's own, more stringent, standards

An attorney contracted by the Construction Programs Bureau researched case law and determined that existing law appears adequate to support explicit ordinances. Drawing from ordinances used in other states, the state facilitator drafted, and the attorney reviewed, a model ordinance for villages, towns, cities, and counties that explicitly establishes needed authorities.

In February 2001, the council passed a Motion to Proceed with the project, but this did not establish authorities; it only signaled intent. In April 2001 the council adopted an ordinance authorizing it to impose a fee on each household to repay the construction loan and setting that fee at $3 per month. In March 2002 it adopted the model ordinance prepared by the state. When the costs of operations and maintenance are determined, the council will adopt an ordinance setting the fee to cover those costs.

Acquiring Suitable Engineering Services

Because the engineering firm plays key roles in each major project phase, Willard selected its firm through a careful process. The state facilitator drafted an RFP that explicitly required evaluation of technical options for decentralized systems. The village council reviewed, approved, and issued it. A citizen's advisory committee reviewed proposals from engineering firms. An expert on public involvement helped the committee prepare for this task by examining exactly what the village wanted from its engineer and formulating questions for bidders that would help match qualifications with specifications. In the course of its deliberations, the committee observed that it strongly preferred an engineer whose explanations they could understand, and it dismissed one candidate as "too technical"—a shrewd decision, given the importance of clear communication among all parties.

The committee recommended a firm to the council, and its recommendation was approved. The state facilitator drafted a contract, and the council reviewed it, negotiated with the engineering firm to establish an acceptable cost, and approved the contract. The contract defined the engineering firm's fees not as a percentage of construction fees but as fees for specific services performed, based on estimates of person-hours per task. This removed any perception that the engineer might have an incentive to design a needlessly costly system. Conversely, this fee structure can protect engineering firms when less costly construction projects demand as much work as more costly projects.

The winning firm, Engineers Inc, serves small to mid-sized communities and government agencies in rural New Mexico, operating from five locations. Dennis Wagner joined the project early in 2000 when the firm was responding to Willard's RFP for engineering services. He observes that many engineers and regulators are invested in old technologies and resist new ones, and he advise communities to select an engineer who will offer them options. He says his firm approached Willard's project with an open mind, knowing that no one approach is appropriate for all situations and that solutions must be tailored to specific problems. While his firm's proposal invoked its experience with a new technology, it did not propose a specific solution, and it does not specialize in specific systems, for the reason that technologies continue to evolve. Moreover, his firm recognizes that its clients have varying financial and political constraints, and what may be the best option technically may not be acceptable to residents, who are the customers who must ultimately be satisfied.

Defining the Baseline

An accurate description of baseline physical conditions was the foundation for much of the work that followed. To examine and estimate the cost of technical options and recommend a solution, the engineer had to understand the nature and condition of existing onsite systems—and where they were inadequate or altogether lacking. He also had to understand local soils and geology.

The most valuable source of information about septic systems was homeowners and what could be learned by physically examining their property. Thus, Willard's baseline systems were defined through surveys. The engineering firm later conducted a literature search to determine geology and soil characteristics, and, after a preferred option had been selected, it examined soils and conducted percolation tests at specific sites in Willard.

A survey pays dividends

Originally, the engineering firm was to conduct a survey of baseline conditions. But while the funding arrangements necessary to execute the engineer's contract were still in progress, it was decided to expedite the survey by having a third party conduct it. That party was the Rural Assistance Community Association (RCAC). This arrangement also had the merit of avoiding any perception by residents that the engineering firm would benefit from survey findings by recommending a project that the firm would then be paid to design. And because RCAC staff were accustomed to working with residents of rural communities, they would be likely to win residents' cooperation. A survey is, by its nature, intrusive and bureaucratic, and Willard's older Hispanic residents, in particular, might not want to share information about themselves with strangers. Moreover, homeowners who realize their systems don't comply with state regulations may not be eager to share information about them.

At a public meeting, several local residents volunteered to help conduct the survey. One, who had been employed by the Census Bureau to work on the 2000 Census, offered to hand-deliver survey forms and pick them up. This further helped to make the survey less intrusive. It also signaled local support. And the survey itself helped raise the visibility of the project, by "bringing it home" to each household.

The survey was conducted in two parts: a house-to house survey to determine what residents knew about the systems on their property—or the lack thereof—and field verification of the results.

House-to-house survey

This survey proceeded by way of the following steps:

- *Notifying residents*, through public meetings and flyers, of the purpose of and need for the survey.
- *Designing a clearly written survey form* that would capture pertinent information.
- *Identifying each piece of property and its owner* and plotting survey information to a map. This presented a challenge, for several reasons. The village lacked an accurate detailed map; some property had been abandoned; the County Tax Assessor's data on property boundaries and ownership were not up-to-date; data on the location and condition of septic systems were incomplete; street numbers for houses existed on paper but not on physical property. Fire code numbers had to be consulted; so did aerial photos. Joyce Garcia, a village clerk, provided her own valuable

knowledge of the community. Drawing from information sources, RCAC staff created a color-coded map depicting baseline conditions household by household.

- *Recruiting residents to help* with the survey and briefing them on how to conduct it. RCAC assumed that interviewers would gather information from residents by querying them and filling in their answers on the survey forms. Instead, the volunteers distributed the forms directly to homeowners for completion by them. This led to some confusion. For example, the adequacy of a septic system is determined in part by linking its capacity to the number of bedrooms; but what constitutes a “bedroom” is not always clear. Some people who didn’t know exactly what they had in their backyards reported that they had a "cesspool" although in fact they had a standard septic system. For some households whose members were not available, neighbors filled out survey forms, supplying whatever information they happened to have. However, direct distribution of forms did have the merit of expediting data collection; most were returned within 1 week.

- *Compiling and interpreting survey findings*, which largely confirmed village officials’ original estimates.

Field verification of results

Field verification of what residents had reported on the house-to-house survey was conducted by a local septic-tank pumper under subcontract to RCAC. Because the pumper was already known to residents and trusted by them, some homeowners who had initially refused RCAC staff access to their property extended it to the pumper. Verification proceeded by way of the following steps:

- holding a public meeting to present the results of household surveys and to explain why verification was needed and how it would be conducted

- designing a clearly written verification form that would capture pertinent information.

- directly contacting each homeowner and explaining (1) why verification was needed and how it would be conducted, (2) that verification would damage nothing on their property, (3) that no enforcement action would be taken against substandard systems

- conducting the survey

- compiling and interpreting the findings

(Note that because of the possibility of bacterial contamination, a health and safety plan should be adhered to in conducting field verification.)

Survey findings

Despite some confusion related to the house-to-house survey, field verification largely confirmed what homeowners had reported, and overall the survey and verification yielded valuable information. Not surprisingly some of the approximately 20 homeowners who had not provided information for the household survey proved not to have septic tanks. One septic system proved inaccessible because the septic tank was located beneath a room that had been added to the home. In a few instances, no onsite system could be located on the property. Some property not surveyed belonged to owners who had recently received state permits that provided needed information. Some new residents didn’t know their system’s past history, or where the septic tank was, or how old it was. Some systems had not been permitted by the state or predated permitting requirements.

Of 79 homes surveyed,

46 used septic tanks with a leachfield
4 used septic tanks without a leachfield
24 used cesspools, seepage pits, holding tanks, or lack a system altogether
36 were operating systems more than 10 years old
29 percent were reported to have problems including odors, sewage backups, and sewage surfacing in yards

Field verification produced ancillary benefits by identifying some active health hazards that were more severe than expected and some public nuisances. For example, an abandoned hand-dug well lacked an adequate cover; a cesspool was starting to cave in. Remediation of these problems was incorporated into the project's scope of work.

The survey produced another benefit too: the village acquired a much more accurate map of its infrastructure.

Supplemental sources of information

Before the village well was drilled in 1971 and a community water-supply system was built, households had their own wells. Household wells are still used for irrigation for lawns and trees. One was drilled as recently as 1997. Because water samples taken from these wells can identify contamination and because the wells could serve as conduits for pollution, some were examined. But for various reasons they generally did not prove very useful. And one well produced anomalous results: expected to show low levels of nitrate because it is located on the far east side of town near an old landfill, it produced a sample with 5 milligrams per liter of nitrate—five times higher than other samples. This finding is related to the problem of making decisions in the face of uncertainty, discussed above.

Project Blueprint: The Engineering Report

Options

To design a system for wastewater collection, treatment, and disposal, the engineer examined what had been learned about baseline conditions from the survey. He also drew on information from other sources, including a literature search on soil characteristics, geohydrology studies, and water quality sampling data, the village's groundwater protection plan, and a report on remediation of underground storage tanks. He then developed a preliminary engineering report that assessed and costed-out a set of technical options. It examined range of systems—both conventional and more advanced technologies—that might be feasible for a community of Willard's size. Using a selection matrix, the engineer evaluated each option's suitability for Willard against a set of criteria that included complexity, use of resources, ease of operation, environmental viability, public acceptance, and life-cycle cost (including construction, debt repayment and operation costs).

Each basic approach permitted a number of variants. A very simplified summary follows:

- The first two options would not employ individual septic tanks:

  (1) A conventional sewer system that relies on gravity would carry effluent to a passive, central treatment site, such as an evaporative, lined sewage lagoon. For Willard this option was the most expensive.

  (2) A conventional gravity sewer system would carry effluent to several passive treatment sites. This option was less expensive than option 1 because sewer lines could be shorter. The disadvantage was that because these sites would be closer to homes, odor could be a problem.

- Two other options would employ septic tanks, and both would be less expensive than the first two:

    (3) A system employing individual septic tanks with pumps would move effluent to a central treatment site, such as a lagoon. This was the more expensive of this second set of option because of the length of the pipe that would have to be laid.

    (4) Individual onsite systems could rely on gravity to carry effluent not to a central treatment site but to cluster treatment systems each of which served a number of homes.

It was assumed that the system constructed would serve all current water-system users and the village's projected future population (assumed to be an average of high and low population estimates), and that construction would occur within existing village rights-of-way and housing lots.

Rough estimates of total life-cycle costs for the options ranged from $2,292,00 for option 1 to $1,641,000 for option 4.

Based on its analysis, the engineering firm recommended a version of the fourth option above. It submitted to the council and the state its draft report and the companion environmental information document examining in greater detail the potential impacts of that option. At a council meeting, the engineer explained the reports and answered questions from the council and members of the community. The draft report was also reviewed by an independent technical expert, the state facilitator, and several residents, and was revised in light of comments. The engineer stresses the value of review in surfacing all relevant concerns and issues.

The option Willard selected

The goal of every wastewater treatment system that discharges to groundwater is to reduce nitrogen levels in effluent so that, by the time it reaches groundwater, levels will have been reduced to beneath the federal regulatory limit of 10 milligrams per liter of groundwater. A companion goal is to achieve this at the lowest cost. Toward these ends, the engineer divided Willard conceptually into three zones based on distance from the village well. The radii defining the zones were computed by estimating the amount of nitrogen in wastewater and the extent to which rainfall, percolation, and soil conditions would dilute it before it reached groundwater.

Zone A was defined as the critical area within a roughly 885-foot radius of the village well; it contains 40 homes and an estimated 104 residents, the greatest concentration of population in the village. Because in this zone improperly discharged wastewater would be likeliest to contaminate groundwater, nitrogen levels in effluent would have to be reduced to 10 milligrams per liter, the standard for groundwater. Zone B is on the periphery of the critical zone; Zone C is further from it. In Zone B, nitrogen levels in effluent would have to be reduced to 20 milligrams per liter. Because Zone C has no known impact on the village well, conventional onsite systems that commonly produce effluent with nitrogen levels between 30 and 50 milligrams per liter could be employed there. Effluent standards for each zone were based on (1) assumed dilution effects due to precipitation, (2) high-quality/low-nitrogen groundwater inflow due to the gradient from the northwest to the southeast, and (3) calculations of theoretical nitrogen balance.

The wastewater system recommended was configured to reflect a set of factors: (1) If wastewater from Zone A were treated and discharged in that zone, reducing nitrate levels to 10 milligrams per liter would require a higher level of treatment, which would raise costs. (2) Beyond Zone A, nitrates could be reduced to 20 milligrams per liter; thus, locating treatment sites beyond Zone A would be cheaper. (3) Zone C was so sparsely settled that constructing treatment sites there or connecting Zone C septic tanks to treatment sites in Zone B would not be warranted economically nor would it be necessary to meet regulatory standards. Septic tanks and leachfields alone would be adequate and cheaper.

The resulting plan was this:

- Every home would be equipped with a septic tank. Because of the difficulty of determining the condition of existing tanks, except for a few reliably known to be in good condition, new ones would be installed.
- In Zones A and B, gravity would carry effluent from each tank through pipes to one of five cluster treatment systems located in Zone B, away and downgradient from the well. Each cluster would serve approximately 4 to 8 homes, depending on the number of bedrooms in each. Effluent treated by each system would be discharged into a leachfield constructed next to it.
- In Zone C, next to each septic tank, where existing leachfields were inadequate, a new leachfield would be constructed into which effluent from the tank would be dispersed.
- Collection and treatment systems would be underground.

Each cluster treatment system would consist of a treatment tank, a recirculating textile media filter, and a leachfield that together constitute a bioremediation process of nitrification and denitrification and employ no manufactured chemicals. The system is described in Appendix F.

To enable the village to direct available funding to its most critical problems first, the project would be implemented in two phases. Phase I would address the 40 homes in the most critical zone, Zone A; Phase II would address the remaining 60 homes in Zones B and C.

As the project has progressed, the approach has been slightly modified. The number of clusters was reduced from 5 to 3, and the number of homes served by each cluster has risen to 20. The cluster treatment systems that have been installed will serve Phases I and II, but at each treatment site a second system could be installed if needed to accommodate future growth, for a total of 40 homes served per cluster. Phase I has dealt with 32 homes in Zone A, not the 40 originally planned, but homes beyond Zone A that lacked septic tanks were also included in Phase I, so that no cesspools would remain at the conclusion of this phase. Pipes are being laid in alleys, not streets, to minimize conflicts with the drinking water system. And while all three treatment sites had been constructed by the end of Phase I, funding constraints deferred until Phase II the start of operations on the third, which is downgradient in the direction of groundwater flow and therefore less critical to pollution prevention.

Overall, the technical solution offers a set of significant advantages:

- Phased construction eases funding constraints, thereby ensuring that the most pressing public health problems are addressed first.

- Tailoring the design to site-specific conditions protects the aquifer from homes closest to the village well.

- Tailoring the design to site-specific conditions minimizes construction costs: only work essential to bringing each piece of property into compliance will be performed.

- Employing only three cluster systems increases the length of pipe that must be laid but overall significantly reduces costs of construction as well as operations and maintenance.

- Treatment sites were located at some distance from existing residences, thus minimizing objections about odors and proximity to homes and enhancing public acceptance.

- The cost to village residents of constructing and operating the system would be less than the cost to individual property owners of bringing their own systems into compliance with regulatory standards and then maintaining them in compliance.

- The system constructed meets the needs of current homeowners only; they pay only for what they need. A modular approach means the system can be expanded in the future, and its expansion can be paid for in the future.

The changing nature of engineering reports

Ideally, the engineering report would be easy for local officials to understand and explain to their constituents. But while the engineering firm's work was sound and has served Willard well, its report was not easy for lay people to understand. In part this was because it was designed to respond to a complex set of federal and state requirements. Since Willard's report was prepared, the Environment Department has won agreement from three other funding agencies to use one set of criteria for such reports. They are the Rural Utility Service, the state Finance Authority, and the Local Government Division of the Department of Finance. All four—the primary source of funding for wastewater projects—now use Rural Utility Service criteria, which can be downloaded from a web site. This will not only produce a document that is easier to read; it will make engineers' work easier and simplify the criteria federal and state agencies use to evaluate such reports.

Willard's engineer suggests that adding a plain-English abstract with illustrations to engineering reports could help lay readers. On the other hand, the former mayor observes that for lay readers, documents, however clearly written, may not matter much: residents learn best through discussion and exhibits.

Environmental studies: another tool

While the purpose of a wastewater project is to protect the environment, such projects could produce adverse environmental impacts. Projects that use federal funds must prepare environmental assessments and issue them for public comment, or explain why an assessment is not warranted. But even for projects not subject to these formal requirements, it is useful to consult the public to ensure that any significant potentially adverse effects have been identified and are adequately understood.

Drawing from the engineer's environmental information document, the state facilitator prepared the environmental assessment. It examined effects on archeological, cultural, and historical resources; aesthetic values; air and water quality; threatened and endangered species; biological and botanical resources; and environmentally sensitive areas. The potential for generating odors was also examined, along with socioeconomic and environmental justice issues, overall and cumulative environmental impacts, and regulatory compliance. After the draft document was issued for public comment, the state concluded that any adverse impacts produced by the project could be reduced to acceptable levels, and it issued a formal Finding of No Significant Impact.

The Potential Deal-breaker: Costs to Residents

The village now had a sound plan and the funding to implement the first phase of it, and regulatory requirements had been satisfied. But would Willard's residents accept the plan? The issue with the greatest potential to derail the project was cost: What would it cost Willard's residents to repay the construction loan and pay for operations and maintenance? In any community with a marginal economy and in which many residents have fixed incomes, this issue will inevitably loom large, and in Willard it arose again and again. The extremely important—and sometimes subtle—public communication dimensions of this issue are discussed in the next section; this section discusses only the financial dimensions.

Willard's residents would pay for the following:

Components of the system will be inspected.
Maintenance and repairs will be performed as needed.
Service calls will be answered.
Septic tanks will be pumped every few years.
Careful records will be kept of inspections, maintenance, and pumping.
The state revolving fund loan is being repaid over 20 years.
Water sampling will be conducted quarterly as required by state permits (discussed below).

Estimating operating and maintenance costs for any new system is not easy, and Willard's project is a demonstration project without precedent in New Mexico. But the engineering firm estimated that the total monthly cost for Phase I would be $8, and that this will rise to $15 in Phase II. Of these amounts, $3 represents the loan repayment. One factor works to Willard's advantage significantly: if Willard had had to borrow the money it received as grants from EPA and the state legislative match appropriation, the loan repayment fee would have risen to almost $30 a month—ten times as much.

Could Willard's costs have been reduced? Unfortunately, all small communities are burdened by a diseconomy of scale: the smaller the community, the larger the share-per-resident of project costs. This is because costs are not strictly scalable: some portion is independent of project size. Thus, Willard's costs could not be easily reduced, and residents simply had to decide how much preserving their drinking water was worth to them—in the near and long term.

The village did have some latitude in determining how to levy the payment. Options included these:

- linking a monthly fee to total project costs divided by the total number of households
- linking a monthly fee to household water usage
- increasing property taxes
- funding the cost through a gross receipts tax (however, revenues in Willard are too marginal to make this a realistic option)

The council chose the first.

Outreach, Resistance, Acceptance

Although this subject comes late in our case study, it is of paramount importance, because public opposition could have killed the project and earning acceptance proved the most difficult task. The subject is addressed here because information in previous sections provides the context needed to best appreciate it.

Commitment and constraints

From the outset, all parties understood that success depended on public acceptance, and that cost could be the deal-breaker. Unfortunately, residents' water bills had already risen to reflect the costs of the drinking water system constructed in the mid-1990s, and the gas company had recently raised rates sharply. And a set of constraints further complicated the task of building support:

- *The project lacked a full-time champion.* No champion could be present in Willard on a continuing basis to share information and informally elicit concerns, identify misconceptions, address them, and build support. Mayor Perea was a strong champion, but he had other responsibilities and could only give limited time to the project. The state facilitator, who had a full-time job in Santa Fe, could not visit Willard often. Because public acceptance and involvement would be crucial, he enlisted experts to help build public understanding and foster grassroots support. Their help proved valuable, but he could afford only a little of their services. Limited village staff and lack of Internet access constrained communication. The fact that the position of village clerk was part-time for the first year-and-a-half of the project hampered communication too. Inevitably, as communication suffered, so did continuity and follow-up.

As the state facilitator puts it, “Willard didn’t have one consistent sparkplug because there’s less community there than meets the eye. It’s not close-knit; there is no local economy, so residents who work must go out of town, and the closest town is 15 miles away. Children go to school out of town. Many people just don’t have time to devote to civic matters.”

- *At first, the council was not fully committed.* Council members themselves did not all support the project consistently, and this affected their ability to muster the quorum needed to vote on key project steps. If a reluctant council member did not appear, the project could be delayed. This affected scheduling, too: the mayor needed to know who would attend council meetings and what would be on the agenda in order to invite the state facilitator to drive down to Willard for the meeting. As Louis Perea recalls, “Council support differed from meeting to meeting. At one meeting, the council might be supportive; by the next meeting, if they’d talked to opponents of the project, their views could have shifted.“ This indicated that council members were listening to their constituents and were responsive to them. But it also indicated that constituents did not yet grasp the need for and benefits of the project.

- *Long-standing factions could divide the community*. In Willard, as in many small communities, some residents align along factions rooted in long-standing family animosities. Some residents may have opposed the project in part or solely because it was supported by a faction unfriendly to them. The cost issue, the most powerful reason they could invoke for opposition, may have been a proxy for personal differences. Louis Perea says his goal as mayor was to bring Willard’s residents together to see the value the wastewater project held for all of them.

These constraints were compounded by some misperceptions, discussed further below.

Overcoming constraints required providing information, encouraging attendance at meetings, and encouraging the active involvement of residents. Their participation could help move the project’s work forward—and, just as important—signal local support for it. Their knowledge of the community could be invaluable in understanding wastewater problems and formulating solutions. And the better residents understood the project’s merits and made its goals their own, the greater the likelihood of long-term success.

The following pages describe the efforts made. Recommendations for how other communities might best manage these matters, drawn from lessons learned in Willard, are offered in Appendixes B and C.

Informing the public and correcting misperceptions

Former Mayor Perea’s reflections are instructive. It took a lot to sell the project, he recalls, and the most effective means was the simplest: talking directly with individuals, one-on-one, both to convey information and to understand objections so they could be addressed. Recognize that there will be resistance, he advises. “You have to listen to what people say and help them understand the benefits. If you turn one person around, that might extend to other families.” Clerk-Treasurer Gayle Jones echoes this: “The biggest problem is community education and awareness.” She concludes that there are no easy solutions, but that you must “stay in touch with your customers. When they’re outraged over a $3 bill, sit down and explain the benefits for current and future generations.”

Louis recalls residents objecting that the project was too expensive and asking, Why not move the well? But, he pointed out, contamination would continue; “How do you fix the *ground*?” Some residents even thought he was promoting the project because it would benefit him. He had to explain that he had already invested in his own septic system, and that his motivation was to benefit the village and future generations.

To help bring the problem home, he suggested residents look at conditions on neighboring properties, note whether water was visible on the ground surface, and consider whether their own systems were adequate. He recalls that some residents said they'd lived with such conditions for years and had come to accept them. Others said, for example, " My daughter moved into a mobile home, and I had to spend several thousand dollars to fix her septic system, so why should I have to pay to solve other people's problems?" This equity issue cut deep: other residents, too, were questioning why the entire village should pay to benefit households who had not maintained their own systems adequately.

Alphonso Valdez, now mayor, had been a councilman and Mayor Pro Tem when the wastewater project began. While he is now firmly committed to the project, he recalls that while he was on the council he did not initially support it. The reasons he cites are understandable—and significant because they were shared by other people. Mr. Valdez recalls that when he first moved to Willard he installed a septic system at his own expense. When he moved within Willard he paid to install another. He did not want to now pay to install systems for other people. Moreover, Mr. Valdez was sensitive to the plight of residents on fixed incomes who would not want to bear a new expense—particularly in light of Willard's increased water and gas bills. And he could point to no outpouring of community support for the project. Only gradually did he come to appreciate the project's importance and long-term benefits.

Resistance to the household fee was compounded by the fact that it was new: households had never before paid the village for wastewater services, and some had evidently never paid for such services at all.

Both the former and current mayors made a crucial point: particularly in a low-income community, it is important to neither overestimate nor underestimate costs. People must not be misled about what they are getting into; credibility counts.

Public meetings: careful planning, wide notification, low attendance

As required by federal regulations, the village held a formal public hearing on the draft environmental assessment. But it went far beyond this requirement to share information and involve the public. Its efforts were a model of open government that keeps citizens informed, solicits their thinking, and encourages their involvement.

Project issues were discussed at many council meetings, public meetings, and several formal public hearings. For some meetings, the state facilitator supplied flyers to the village clerk for distribution to each household. Notices were posted in the Village Hall, post office, senior center, gas station, and cantina. For some meetings, several notifications were made. Bulletins reporting on project progress were distributed to each household. Information, including the state's formal announcement of its finding of no significant environmental impacts, was included on the section of monthly water bills used for messages.

In advance of meetings, care was taken to determine the optimum way to present information in the form of tabletop models of filtration systems, brochures, and posters; to configure the meeting room; and to promote a good dynamic among speakers and listeners that would encourage discussion. For several meetings, inducements were offered in the form of raffles, door prizes, and a potluck meal. Both the former and current mayors underscore the value of this.

Former Mayor Perea believes the tabletop exhibits were particularly valuable in helping residents *see* that there was better option. Also valuable, he notes, was the participation of people from state agencies who talked with residents and answered their questions. Mr. Perea remembers that when the state facilitator asked him who to bring to public meetings, his reply was, "We need all the help you can bring in."

Despite vigorous efforts to promote and induce participation, attendance at most meetings averaged only around a dozen people. However, the state facilitator points out a significant pattern in attendance: a core group of people would attend many meetings; another group whose composition changed over time would also attend. This means that a larger total number of individuals did attend. He also points out that, particularly during the early stages of the project, those residents who attended meetings and voiced support helped create the conditions that moved the project forward. While their role was not highly visible, it was highly valuable.

Several factors probably kept participation low. Residents were busy with their own lives and absent a crisis were unlikely to enlist in a crusade. The former mayor concludes that for low-income people, the project was simply not a priority; other priorities were competing for attention. Clerk-Treasurer Gayle Jones believes people tend to be content with their lives as they are and to resist change. And she observes, drawing on her experience as former treasurer and current councilwoman in Mountainair, as well as on her knowledge of Willard, “Everywhere, people don’t turn out for public functions anymore; public meetings don’t work well.” Assistant Clerk Joyce Garcia concurs that while it’s important to try to get people to attend meetings, it may not be realistic to expect them to. “People like to complain but they don’t want to go to meetings.”

But in Willard, though meetings did not work as well as hoped, they worked well enough to move the project forward, though the path was far from straight and smooth.

Other forms of public involvement

Even when not well attended, public meetings were the most visible and continuing form of public involvement. Less visible but more active forms were valuable, too. “Involve as many people as you can,” Louis Perea advises, because you will need a lot of help.” Involvement was actively encouraged, and Willard residents stepped forward to play several roles.

One of the most important was membership on the citizens’ advisory committee formed to help select an engineering firm. The former mayor recalls that this committee not only helped with the selection process but was itself an effective outreach tool. A few residents informally reviewed the engineer’s preliminary report. Some residents helped conduct the house-to-house survey; many others contributed information to it. Some homeowners made their private wells available for sampling; some have agreed to make their wells available for monitoring once the system is operating. Other roles are possible, too.

The council prevails over protest

A citizens’ petition

One issue had long simmered and arisen in various guises. Twenty-one months into the project—after the council had voted to proceed with the engineer’s recommendation and on the eve of its decision to execute the binding grant and loan agreements necessary to proceed—the issue erupted. A petition signed by twenty-five residents protesting the cost of the project and disputing the need for it was presented at a council meeting. That meeting *was* heavily attended, and several hours were devoted to heated discussion of various aspects of the project, some of which had been previously discussed and were assumed to be closed.

One project advocate challenged the protesters by asking where they had been for the last year when meetings were held. Mayor Perea reminded them that the project had been well-publicized and that in a vote taken at the last meeting the council had agreed the project should proceed. He outlined options and costs, and, observing that the chief concern seemed to be the size of the monthly fee, suggested residents attend the next meeting, when the new ordinance and fee schedule would be discussed. Faced with the protest, the council took a stand, declaring that the village had done too much to turn back and that the project was essential.

At the next meeting, in voting to levy the $3 monthly fee required to repay the state loan, the council cleared the way for the state to make the loan. Since May of 2001 the village has been collecting the fee. The monthly fee for operations and maintenance has not yet been established.

The sensitivity of cost prompts consideration of how the issue might have been handled more effectively. While the estimated cost per household had been announced earlier in a flier and discussed in public meetings, it had evidently registered only gradually. Should this figure have been announced much earlier—and more loudly—to give residents more time to understand it, debate it, and perhaps come to accept it? But because the Willard project was a demonstration, there was no precedent for estimating cost data, and it fell to the engineer to estimate it in the preliminary engineering report. Thus, reliable estimates could not have been provided at the start of the project. But if a “worst case” figure had been announced to get the dialogue going, and then replaced with better estimates when they became available, what would have been the result?

And what if a tough message had been communicated at the outset: Residents without adequate septic tank systems are violating state groundwater regulations; this project can help them achieve compliance. Would the project have been more clearly perceived as a solution, rather than as a problem?

Ramona Rael, Financial Manager of the Construction Programs Bureau, attended meetings in Willard. She suggests the best approach may be to help the community take a realistic look at what the monthly fee will cost and cover, and to consider the alternative costs of adopting a far more expensive central treatment system. Gayle Jones stresses a key concept: the village will be actively managing the entire system for the benefit of everyone and all households will have their septic tanks inspected, maintained, repaired, and pumped in return for the fee. The monthly fee is reasonable compared with what each household would have to pay for these services itself, and in light of the huge benefit it will deliver.

Resistance to cost reflected a much deeper problem: lack of understanding of how wastewater could contaminate the common drinking water source, and the potential gravity of that problem. That in turn reflected the need for basic public education. To help other communities address this issue head-on, early-on, and skillfully, a list of questions residents wanted and needed answers to is presented in Appendix A. Readers are urged to consider them carefully.

Construction

Phase I

With funding in place, Willard solicited bids on Phase I construction. Employing a unit price bid that requires bidders to supply cost data for each component of the task permitted control over final costs. The engineer helped evaluate the bids, and the contract was awarded to Yellow Horse Corporation, a firm headquartered in Magdalena, New Mexico.

To construct the three treatment clusters and adjacent leachfields, three sites were needed. Village staff and the engineer examined options and determined what parcels would be easiest to acquire. As with the survey, local knowledge was indispensable here; once again, Joyce Garcia, Assistant Clerk, supplied it. One cluster could be sited on a parcel of land the village already owned; the other two would require purchasing parcels. But acquiring them proved difficult, and the cost of appraisal turned out to be roughly equal to what it cost to buy the property.

With the purchases completed, the village issued the Notice to Proceed to the contractor. Work entailed installing new septic tanks, digging trenches to lay pipe to treatment clusters, constructing treatment clusters and adjacent leachfields, and plugging old wells that could be conduits. As the treatment cluster sites are brought on line, new septic tanks are connected to houses; old tanks will be pumped, disconnected, and filled with clean sand; old leachfields will be inactivated.

For some time the work was ahead of schedule. This reflected the realistic nature of the schedule, which allowed for inevitable delays. For example, there were some delays in getting some equipment and parts, and power hook-ups for the treatment clusters were delayed because of complications related to paying required connection fees and obtaining permits for electrical installations to initiate service.

The engineering firm's inspector, a certified and experienced wastewater operator, has visited the site several times a week or as needed to oversee progress and verify the quality and quantities of materials installed. The project engineer monitors construction progress by communicating closely with the inspector, and he provides direction and performs periodic on-site inspections as needed. Because few construction firms in New Mexico have yet acquired experience with systems that employ advanced onsite technologies, such oversight is particularly important. Dennis Wagner, the project engineer, cites his firm's belief in the importance of monitoring work closely and collaborating with the contractor to adapt design to field conditions. Each party can generate approaches the other might not, he says, and close monitoring can ensure the success of the design.

As required by contract specifications, the manufacturer of the treatment equipment has assigned a field representative to provide technical assistance to the contractor during construction of the treatment sites. And every month a coordination meeting is held on site: village officials, the construction contractor, the engineer, and, if possible, the state facilitator identify issues and concerns and resolve them before problems escalate.

The engineering firm inspector also reviews the contractor's requests for payment, and the project engineer certifies them for payment. Throughout the project, the engineering firm has ensured compliance with federal and state laws and regulations and local ordinances; for example, the Antiquities Act and Endangered Species Act.

In December 2002, when construction was within 2 weeks of completion, bad weather struck, delaying work. In wet weather it can be impossible to operate heavy equipment in Willard's soils, and the construction contractor did not want to muddy up homeowners yards by moving equipment through them. Moreover, rain or snow can smear the walls of trenches that are being dug to create leachfields, preventing the proper percolation that must occur for wastewater to disperse. And when the soil freezes, it can't be excavated. Phase I construction is now scheduled to conclude by mid-February 2003. Two of the three cluster treatment systems will then begin operating to serve the homes that have been hooked up to them.

The president of the construction company, Darryl Pettis, says he strongly favors the technology Willard is installing, which he describes as simple, ingenious, very workable, and a big improvement over sewage lagoons he has observed. Overall, he adds, constructing Willard's system has been simpler than many other projects, and the technical option selected posed no serious problems. Darryl reports that his company had never built such a system but likes challenges and wanted to gain experience with it. His employees are enthusiastic about learning something new, he adds.

Because construction entails "going into people's yards," he points out the value of hiring some workers who live in the community, know it, and are known by residents. And putting some dollars into the local economy by hiring locally is another positive.

At the conclusion of construction a final inspection will be held, with all parties in attendance, to identify anything that requires correction before the village accepts the system and starts operations. And the engineer will conduct an 11-month warranty review of the entire system to determine whether it is performing according to specifications.

Phase II

To obtain funding for Phase II, in November 2002 the village submitted an application to the Local Government Division of the state Department of Finance for a Community Development Block Grant, and it sought a legislative appropriation for matching funds. In January 2003, the Block Grant application was denied, and the village is now seeking other funding.

The engineering firm's contract ends with end of Phase I, but the village had hoped to use funding for Phase II to extend the current contract, as continuity would be valuable and cost-effective, saving the village the cost of another procurement. But with Phase II funding still to be obtained, it appears the village will have to incur the cost of soliciting engineering services for Phase II. With design work already completed and paid for, engineering services for Phase II will be limited to helping the village to prepare a bid package for a construction contractor, evaluate bids, and prepare a contract, and providing the construction management services described above.

Because the engineer had prepared specifications for the entire project before Phase I was bid, when funding for Phase II does become available, the village will be ready to solicit bids from construction firms and can proceed to construction within 60 days of selecting a firm.

Operations

To proceed to operations, the village must obtain permits from the state; it must determine the fee each household must pay for operations and maintenance; it must further develop the administrative framework for managing its wastewater system; it must ensure that households understand their own responsibilities.

Obtaining permits for the system

The village owns the new septic tanks that have been installed because it used public money to install them and they are part of a wastewater utility that the village will be operating. To operate a system that discharges wastewater, a permit must be obtained. As the system operator, the village is the party to which a permit will be issued. But for Willard, a question arose as to which state authority should issue it.

- The Environment Department District Office, which enforces liquid waste regulations, permits individual septic tanks discharging under 2,000 gallons per day. Its permits require that septic tanks and leachfields be installed and constructed according to permit specifications. It does not require groundwater sampling.

- The department's Groundwater Quality Bureau requires discharge permits for systems discharging more than 2,000 gallons per day. Permit holders must monitor their system's performance by sampling quarterly for key contaminants, including nitrates, to ensure that levels of nitrogen in groundwater do not exceed 10 milligrams per liter. The permit must be periodically reviewed and updated.

The question of which authority issues permits has consequences for system design and operating costs. The original engineering design for the project assumed the District Office would issue permits for individual tanks, each of which falls below the 2,000-gallons-per-day threshold, and that therefore no groundwater sampling would be required. Accordingly, cost projections did not reflect sampling costs. Originally, to avoid quarterly sampling requirements and associated costs, five treatment sites were planned, no one of which would exceed the 2,000-gallon threshold. After consultation, the Bureau decided to require a groundwater discharge permit for Willard's total system because of cumulative effects on the groundwater. Because this obviated any reason to keep individual treatment sites below the 2,000-gallon threshold, the number of treatment cluster sites could be reduced from five to three. Because in Zones A and B, septic tanks discharge wastewater to the cluster treatment sites, the Groundwater Bureau will issue a discharge permit for those sites, and Willard has applied for such a permit. Because in Zone C septic tanks individually discharge wastewater to the ground, the District Office will issue permits; but the village will issue its own permits, too, as its performance standards are more stringent. For property owners constructing new buildings after the conclusion of Phase II, permit requirements remain to be determined. Those owners will have to pay for installation of septic tanks and—in Zones A and B—for the hook-ups to treatment clusters. If capacity is not available at a cluster, either the village could choose to expand the system, or those homeowners would have to install their own compliant system to meet the effluent standard for that zone.

Instead of requiring the village to drill new monitoring wells for sampling, the Groundwater Bureau has agreed to let Willard use existing wells.

Adopting an ordinance and determining a fee

While the council has adopted an ordinance for repayment of the construction loan and an ordinance establishing its authority to operate the system, it must still establish an ordinance setting the fee each household will pay for the costs of operations and maintenance. The state facilitator will be working with Willard to develop the language of the ordinance, and once the level of service and costs of contracting for pumping are known, the fee can be determined. It will be added to the current $3 monthly loan repayment fee and included in monthly water bills. The council is expected to adopt the ordinance early in 2003. As Mayor Valdez observes, it is important to start collecting the fee soon. The first few years won't present significant costs, but when septic-tank pumping begins, the village will need a kitty.

Managing operations and maintenance

While the specific nature of the tasks performed to manage the wastewater system will change through time as the system ages, the basic functions will remain these:

- inspecting and monitoring system components
- performing maintenance and repairs and responding to service calls
- maintaining careful records of work performed
- conducting quarterly groundwater sampling
- periodically pumping septic tanks

Inspections and water sampling must be performed by someone certified by the state. While the village could have contracted for all these functions, it has chosen to assign the first four to the village employee who operates the drinking water system. He will become certified by the state, and he will receive on-site training during start-up from the manufacturer of the treatment system, as provided for by the construction firm's contract. The manufacturer has provided the village with a manual for the treatment systems, and the engineer will help prepare a maintenance and operations manual. The manufacturer will also provide continued technical assistance to the system operator during the 1-year warranty period.

Alternative arrangements for these functions should be noted. It is not uncommon for New Mexico communities to contract for inspection and maintenance services from an individual who is employed by another community for this purpose. And an increasing number of communities are contracting with firms that specialize in utility operation.

Early in 2003 the village will solicit bids for pumping services, as they require special equipment. Pumping will probably be done on a rotating basis, starting with tanks that are not connected to treatment clusters.

But beyond management of the physical infrastructure, the village needs an administrative framework to ensure orderly operations. While that framework is still being developed, the model ordinance Willard adopted goes a long way toward defining it. And as the system operator is trained and certified and acquires experience with the system, he will be developing his own schedules for inspecting components of the system and arranging for septic-tank pumping. The village will develop procedures and forms new residents must follow to apply for permits for new systems and standards for issuing certificates of occupancy. The state facilitator will help as needed with this planning.

At present the state has no requirement for periodic review and evaluation of how efficiently wastewater systems are being managed, but the Construction Programs Bureau strongly encourages communities to conduct such reviews.

Helping residents understand their continuing responsibilities

Current and future residents will have a continuing responsibility to contribute to the wastewater system's smooth operation. Specifically, they must do three things:

- pay the monthly fee for loan repayment and operations and maintenance
- take care to not dispose of materials that could damage the system or otherwise impair its performance
- periodically permit access to their property so that their septic tanks can be inspected, maintained, repaired as necessary, and pumped

The public information efforts already made to date have helped residents understand their role, and it has prepared them for imposition of the monthly operations and maintenance fee. Future efforts will include distribution to each household of a "do and don't'" brochure supplied by the manufacturer of the treatment system and inclusion of information on monthly water bills. The state Construction Programs Bureau will direct the village to other sources of information that may be useful. And the project engineer reports that on some projects his firm has provided information that communities have used for homeowner education, including graphics that illustrate the nature of the systems installed and bilingual materials.

Project Cost and Schedule

Understanding project costs is obviously essential to determining what financing is needed, what funding options are appropriate, and how much local residents will have to pay for the system. But, as the state facilitator points out, knowing what a decentralized system will cost is like knowing what it will cost to buy "a car." Many factors affect cost, including the variability of site conditions, the severity of problems, the nature of the technical solution adopted, local labor market conditions, and the cost of materials. Construction costs will be the lion's share, and they can be difficult to estimate if, for example, site conditions that could not have been anticipated are encountered. "Change orders" are commonplace. Also, as New Mexico contractors gain experience with systems that employ new technologies, construction costs could fall. Schedule is highly variable, as well.

Costs

For Willard, the engineering firm developed cost estimates and has helped the village understand them and adjust them as the project has evolved. Engineers use a 20-year planning period, not because a system will last for only 20 years but simply as a convention. For Willard, the 20-year life-cycle cost for Phase I and Phase II combined—including construction, operations, and maintenance—was estimated at $970,000. The estimated cost per household for Phase I was c. $12,000. Because Phase II does not require construction of additional treatment clusters, it reduces the estimated cost per household to c. $10,000. Repaying the $63,000 state loan at 1 percent interest over 20 years costs Willard roughly $3,500 per year.

Total *project* costs to Willard for engineering and construction—independent of the cost of operations and maintenance and loan repayment—are estimated to be $1,085,900; Phase I costs are estimated at $572,700; Phase II at $513,200. Willard's engineering firm strove to make realistic estimates and to allow for inevitable contingencies. Its forecasts have proved sound, and actual costs are running within budget. By the time Phase I is complete, costs incurred directly by Willard will be as follows:

Willard's Direct Costs for Phase I

Cost Element	**Budgeted (will be actual by the end of Phase I)**
Engineering fees for planning and design (Includes appraisal costs for acquiring parcels needed for cluster treatment sites)	$73,316.67
Engineering fees for construction management services, including inspection of construction work	$38,900.00
Acquisition of property needed for easements	$6,000
Construction costs for installing or replacing septic tanks, installing pipe, constructing three treatment systems, installing electricity and obtaining permits for it, and arranging for hook-ups	$454,483.33
Total	$572,700.00

It should be noted that the village has not attributed any of its own administrative costs to this budget, and that so far it has incurred no legal costs. Survey costs borne by the state Drinking Water Bureau are not reflected in this budget, either.

Estimated costs of operations and maintenance

Future decisions about contracting for pumping and water sampling will produce actual cost data. For Phase I, the engineering report estimated the household fee at $8 per month: $3 to repay the $63,000 construction loan over 20 years; $5 to cover the costs of operation and maintenance. After Phase II is complete, the fee could rise by an additional $7 a month, to $15 to cover the cost of maintaining the additional onsite systems for Zones B and C.

By contrast, the cost to homeowners of maintaining their own leachfields, having their own tanks pumped every few years, repairing their own tanks as needed, and eventually replacing them with systems that meet the state groundwater standard could involve monthly costs of up to $35 over a 20-year lifecycle. Because if the village pays for pumping, several tanks can be pumped at once, the cost to each homeowner would be lower. Annualized, cost estimates for operation and maintenance for Phase I are roughly $9,800 a year; for Phase II, $18,400. Better cost data will become available as operations proceed.

Schedule

Sources of delay

The Willard project has taken far longer than expected. The original schedule assumed 1 year would elapse from the state's March 1999 meeting with the mayor to completion of construction. The start of operations for Phase I is now scheduled for mid-February 2003. It was hoped that funding for Phase II would be available in the spring of 2003 and that Phase II would be complete within 6 months. But the village's application for a 2003 Community Development Block Grant was denied, and it is now seeking other funding. Consequences for the schedule for Phase II can't yet be forecast.

In retrospect, delay seems inevitable, for a set of reasons sketched below. But it should be stressed that no serious technical difficulties were among them.

- The funding and partnering arrangements were unique and together necessitated slow steps.

- The fact that the project was a demonstration meant there was no precedent in New Mexico from which to learn. Indeed, the Willard project is the only project identified as an EPA onsite wastewater management demonstration project between Missouri and California.

- It was sometimes hard to schedule meetings among geographically distant parties. The state facilitator worked full-time in Santa Fe, about 1 hour and 45 minutes away from Willard. The engineer was based first in Socorro, now in Carlsbad, which is 3 hours from Willard.

- Communication was slowed by the fact that the village does not have e-mail, and for the first year-and-a-half of the project, the village clerk worked part-time. And turnover introduced discontinuities. For example, shortly after the project began, the clerk left, and her replacement could not locate documents essential to the bridge loan application. As the engineer observes, turnover should be expected in the course of a project.

- Lack of a quorum sometimes delayed council approval of required steps. In some instances this reflected lack of support and even resistance within the council, which in turn reflected lack of strong community support.

- Without its own attorney to review and certify documents, the village needed help obtaining this service. And the RCAC bridge loan for the engineering report was delayed because records documenting village incorporation had been destroyed in a fire in 1912. Moreover, because RCAC had never executed a bridge loan for a revolving fund loan, it had to establish its own procedure in cooperation with the state Environment Department, and this took time, delaying the engineer's work.

- Finalizing the engineering design and specifications was delayed because acquiring title to the treatment sites took longer than expected. The required appraisals and negotiation with out-of-town owners and their attorneys delayed the start of construction.

- Power hook-ups for the treatment clusters were delayed because of the complications related to paying for services, and the contractor was delayed in obtaining needed state permits.

While paperwork was not cited as a source of delay, Willard's Assistant Clerk, Joyce Garcia, notes that at some points it was burdensome, and the state facilitator agrees it can be significant, particularly for a small village whose few staff have many duties. But the current mayor points to some advantages Willard enjoys: he himself has a great deal of experience with government; the clerk-treasurer is extremely knowledgeable about finance and administration; the state facilitator keeps the village well-informed about how to proceed. Overall, the mayor observes, the project does not present a confusing or intimidating process.

Prospects for the project—and its story

As the project moves toward Phase II of construction, all parties interviewed concur that it now seems generally well-accepted. Former Mayor Perea believes that while some resistance may remain, most residents understand how the project benefits the village. Current Mayor Valdez continues the former mayor's commitment and is confident the project will succeed; indeed, he stresses, it must. In the March 2002 elections, a resident who had been a strong project advocate, actively involved, was elected to the council for a 4-year term. This seems to signal community support—or at least, absence of significant opposition. Other council members support the project, too. The clerk-treasurer's firm grasp of government finance and administration augers well.

Overall, this team seems likely to continue the project's success, realizing not only the goals set for Willard, but the state's and EPA's hopes that the Willard project will serve as a model that other communities can adapt to their own circumstances.

In New Mexico, in which both water and money are scarce and precious resources, the direct link between sound wastewater management and protection of drinking water is clear; the need for affordable wastewater management systems is pressing. Governor Bill Richardson made water issues a top priority in his 2002 campaign, and he has clearly signaled that they are a top priority of his administration. It seems likely that his administration will want to tell Willard's story widely, so that what has been learned from it can help other communities achieve successes of their own.

APPENDIX A - Questions from Residents That Demand Clear Answers

Many questions arose in the course of the Willard project and are likely to arise in other projects. They warrant the closest attention, early on, and they are consolidated here for ready reference. While they overlap with the subject of the next appendix, it can be useful to consider them in isolation.

Questions raised directly by residents

- *Sticker shock: What will this cost me? We've never paid for this before; why should we pay now?*

  This was the bottom-line question, and many other questions were essentially variants on it or attempts to invalidate the project so the cost issue would go away. Residents who have not been paying for wastewater management may resist a new payment—particularly in a community that is not affluent. In Willard, recent increases in water and gas bills aggravated this problem. For all projects, the issue of cost to homeowners must be weighed against the costs of not solving the problem. For a village, this could be erosion of property values and of opportunities for economic development.

- *Perceived cost inequities: Why should I pay for my neighbor's septic tank? Why should people who live far from the well have to pay for the solution?*

  These questions were posed by residents who had spent money to install or upgrade their own septic tanks. The fact that the technical solution designated three physical zones, with the highest levels of treatment in Zones A and B, added a twist. Some people on the perimeter of Zone C, whose wastewater was less likely to affect the area around the village well, wondered why they should pay at all.

  In fact, the wastewater-management system is an extension of the drinking-water system that the community already pays for. And because the project will benefit the entire community, all residents should share in its cost.

  Moreover, every household will directly benefit from the fee it pays: the village government will arrange to inspect, maintain, repair, and pump every septic tank.

- *If we can't pay the monthly fee, will our water be turned off?*

  Yes. Community water and wastewater service providers have the authority to terminate service if fees are not paid.

- *Will my property taxes rise if a new septic tank is installed on my property?*

  The village council, in consultation with the community, decided to pay for the system not by raising property taxes but through a flat fee added to monthly water bills.

- *Is village water really threatened? Sampling results vary. And if the water table is dropping, contaminants won't reach it. What will happen if we do nothing?*

  Once a pathway between human waste and drinking water is established, many forms of contamination are possible. Therefore, given the uncertainties inherent in sampling, residents will do best to use data as indicators and rely on common sense: *How could our drinking water* not *become contaminated?*

- *Why can't we just dig a new well in another location?*

  The state must protect all groundwater from contamination, not just the water we happen to be tapping. It is against the law to pollute any groundwater. And digging a new well does not address the problem of sending pollution "downstream."

- *Why can't we just treat the water?*

  Preventing contamination is cheaper than treating it.

- *How long will the proposed system last, anyway? How much maintenance will it require? Will we be replacing it all over again in 20 years?*

  Every system, including sewer systems, requires maintenance and, eventually, repair and even replacement of some components. Proper maintenance prolongs every system's lifetime. In preparing cost analyses, engineers traditionally use a 20-year planning period, but this does not mean that the system will only last for 20 years. Onsite systems are expected to last as long as conventional sewer systems.

- *Why is the state forcing this project on us?*

  Because the project lacked local champions who could be continuously visible, some residents perceived the project as a state not a local project. Conversely, some people seemed unaware the state facilitator was a state employee.

  The state facilitator repeatedly stated in public meetings and in meetings with village officials that (1) the project would only be pursued if the village chose to pursue it, (2) the state was making funding available for studies that would provide information the village could use to make its own decisions. In fact, Willard has made its own decisions.

- *Who will help us with the paperwork for this project?*

  The state routinely helps communities with paperwork.

Other questions that required answers

- *What's the big project-management picture? What will happen, when? What is the process/what are the steps?*

  At the outset of the project and throughout, it would be helpful to present a milestone chart depicting key project steps, to help residents more readily grasp the "big picture" and appreciate the very real progress they are making.

- *How can residents participate? How can residents help?*

  To encourage involvement and underscore that the project belongs to residents, from the outset it would be useful to sketch the many ways they can participate in the process, including attending and participating in public hearings and council meetings and volunteering to review reports and plans.

APPENDIX B – Other Problems Encountered

In addition to the questions identified in Appendix A, other problems were encountered.

Lack of a crisis and of compelling data

Because residents were not ill, and because data on nitrate contamination were limited and somewhat ambiguous, wastewater was only a crisis in-the-making. It was necessary to rely on a common-sense argument that contamination was inevitable and that the problem is easier to deal with sooner rather than later. Because the village had competing priorities, those not perceived as urgent were at a disadvantage.

Lack of understanding of the potential gravity of wastewater issues

The issue of cost reflected this problem, with the result that some residents perceived the project not as a welcome solution but as a problem itself. Had more residents understood the grave nature of the problem, more of them might have championed the solution.

Lack of a local champion

It was impossible to fully compensate for the lack of someone local who could gather and share information, build support, and signal the local character of the project. The state facilitator works in the state capital, Santa Fe, about 1 hour and 45 minutes driving time from Willard. This was a barrier to maintaining a presence in Willard and ensuring continuity and follow-through. His project budget could cover only a few trips to Willard for experts on public involvement and creation of wastewater management districts.

Community factions

It was necessary to function as a sociologist to identify informal patterns of authority and competing factions within the village. Animosities complicated the process of building consensus around project goals.

Part-time government

Village officials are essentially unpaid and part-time; they are busy with other tasks and have limited time to devote to new projects. The village clerk was part-time for the first year-and-a-half. Not surprisingly, some meetings scheduled were not held; phone calls were not always answered; messages left were not always promptly responded to.

Limited village communication infrastructure

The village government lacks e-mail; at one point, a part-time clerk had few computer skills; computer and printer capability were limited.

Delays and discontinuities

Delays and resultant discontinuities dissipated the core team's focus from time to time, and lack of steady, visible progress threatened to dissipate fragile community support.

Inadequate data

The village lacked an accurate detailed map; some property had been abandoned; the County Tax Assessor's data on property boundaries and ownership were not up-to-date; data on the location and condition of septic systems were not complete; street numbers for houses existed on paper but not on physical property.

A less-than-clear key engineering document

While the engineer's work was technically sound, the firm's preliminary report was not easy for lay people to understand, in part because it had to conform to a complex set of federal and state requirements. They have since been revised.

Needlessly burdensome funding applications

The federal and state funding processes imposed two requirements that Willard could not meet.

1. Federal regulations require that to obtain a loan, a village submit an attorney's statement documenting that it is a village and is incorporated. But many villages do not have attorneys on staff.

2. EPA requires applicants for hardship loans to submit data on unemployment rates and median income. Data on unemployment rates did not exist at the village level; 2000 Census data are not yet available for Willard.

Schedule pressures

Ideally, long lead-time would allow for a slow and thorough process of public education and involvement; when public support fully materialized, the village council could move forward. But federal and state funds do not remain available indefinitely; they must be obligated. And project costs may rise with time if, for example, the price of oil spikes. This created schedule pressures.

When to "pull the plug"

With the clock ticking on funding, lack of adequate local support could be fatal. And for the state, over the project hung the question, *If Willard doesn't move more quickly, shouldn't we make the funding available to another community?* At every step it was necessary to assess community support and project viability.

APPENDIX C – Lessons Learned

The community guide cited on page 1of this study presents many recommendations based on lessons learned: some in a chapter by that title; others as the conclusions of several major chapters. What is presented here is a somewhat abbreviated and modified version of lessons that can benefit other communities.

Still other lessons point toward steps state and federal agencies can take to minimize or solve obstacles to successful wastewater projects. Recommendations for them are also presented in the community guide, but they are beyond the scope of this case study.

Note that not all lessons are learned as a result of mistakes! Many simply confirm what proved to be sound judgment.

Be aware of possible sources of project uncertainty and delay

The following factors can introduce uncertainties

- Data from water samples can pose ambiguities.
- How long it takes to obtain funding can affect schedule.
- How long it takes to gain community support can affect not only schedule but the availability of funds: some sources may expire.
- In some cases, acquiring needed easements or purchasing needed land may be time-consuming. For example, in an economically depressed area where there have been no recent property sales, it may be difficult to determine a fair market value. It may even be difficult to determine who owns some property, or to contact the owner. It is prudent to start this process early.
- Obtaining needed permits requires adequate lead time.
- Actual construction costs may differ from earlier estimates; for example, a spike in the cost of oil can drive up the cost of petroleum-based products like plastic pipe; a tight labor market can drive up labor costs. Site conditions that could not have been anticipated may affect cost and schedule.

Defining the baseline

Conducting the survey

- *Survey baseline conditions as soon as possible.* The fact that the results of field verification in Willard largely confirmed what was learned from the household survey suggests that if you cannot initially afford field verification, you can still obtain valuable information from households while deferring verification for the design phase of the engineer's work.
- *Avoid any perception of conflict of interest* by having the survey managed by a third party, not the engineering firm, which might be viewed as benefiting from a recommendation for a costly construction project.
- *Be mindful that a house-to-house survey may seem intrusive and bureaucratic.*

- *Use the survey as a valuable outreach and education tool* that can help raise the project's visibility and build understanding of project goals.

- *Recruit residents to conduct the household survey,* to signal local support for the project.

- *Train interviewers* so they understand the significance of the information they are gathering and can answer questions about the survey form.

- *Ensure homeowners' cooperation* by explaining clearly to them why the survey is needed.

- *Keep it simple.* Terms used on the survey form and by interviewers must be clearly explained, to avoid jargon that residents may misunderstand.

- *Consider language barriers and literacy levels, and respect cultural and demographic characteristics.* In a bilingual community, someone who speaks the second language should go door to door to help gather information. If residents are to complete survey forms themselves, reading levels must be considered in designing the form.

- *In rural areas, ask about wells*. The household survey should ask if wells are located on property, as they could serve as conduits for contaminants.

- *Be resourceful.* Residents' input at public meetings contributed to building baseline information. Information might also be obtained from local septic tank pumpers, installers, builders, plumbers, and hardware store staff.

Gathering other data

- *Identify needed data that are publicly available and gather them yourself*—for example, data on water quality—so you won't have to pay someone to do this for you.

Making decisions despite uncertainty

- *Don't rely on sampling data alone; rely on common sense*. Examine the physical setting and what is known about its current condition and its past history.

Selecting an engineering firm and promoting successful collaboration

Because at the outset of a project most communities can't know what kind of system they will need, an engineering firm will ideally possess (1) knowledge of a range of technical options, or the motivation to explore them, (2) resourcefulness and creativity in formulating options, (3) the ability to communicate clearly with lay people, (4) a genuine desire to listen to community concerns.

Only after a thorough examination of what the community wants from an engineering firm should an RFP for engineering services be developed. Ideally, it will be developed by the individuals who will review proposals and recommend a firm. (The Professional Technical Advisory Board offers technical assistance for procuring engineering services, by helping prepare an RFP. So do some funding agencies.) Here are recommendations that emerge from Willard's successful experience with its engineering firm:

- *The RFP and contract should stipulate these conditions:*

  Engineering fees won't be pegged to a percentage of construction costs. Rather, they will be fees for services provided.

  The engineering firm will examine a range of decentralized options. (EPA's Web site, www.epa.gov/OWM/decent is a good place to start.)

Engineering documents will be clearly written and organized so lay people can understand them. Simple abstracts that include graphics may be helpful. Bilingual versions may be, too.

Each invoice will clearly state what services were rendered in the billing period.

The engineer will provide brief, frequent status reports to parties designated by the client. Where possible, e-mail should be used to facilitate this, particularly because as the project progresses, the distribution list will grow.

Even if the project is not legally required to do so, the engineer will prepare a report on any potential adverse environmental impacts, so it can be offered for public comment.

The engineer will help prepare a maintenance and operations manual.

The engineer will share information with residents, by participating in public meetings and otherwise making information available informally—to a reasonable level of effort commensurate with engineering fees.

- *Take full advantage of technical assistance offered by funding agencies.* They can (1) help prepare the RFP and scoring sheet for evaluating proposals, (2) help residents prepare to interview firms that have submitted proposals, (3) help prepare the contract with the winning firm.

- *Encourage early and active involvement by residents.* They can serve on an advisory committee to (1) define what the community wants from an engineer, (2) help draft an RFP that reflects it, (3) review proposals, (4) ensure that the contract reflects what is wanted, (5) work with the engineer throughout the life of the project.

- *Encourage the engineer to function as a full project partner who is committed to the project's success,* so that he provides the full benefit of his experience and judgment.

Informing and involving the public

Because, as noted above, this subject can be fraught with difficulty and is so important, many recommendations emerge.

Keep the Big Picture front and center

- *Present the project's Big Picture* early and often, and in the form of a graphic, so everyone shares a common understanding of key milestones and the sequence of necessary steps, and can see progress achieved and an end point.

- *Encourage public involvement early on, continually, and in many forms.* Help residents understand the range of roles they can play. Retirees in particular can play leadership roles. (Willard's current mayor is 80 years old.)

- *Remember the "50-30-20 rule."* It is a commonplace that 50 percent of the public is unlikely to care about any given initiative; 30 percent may support it, but silently; 20 percent may be vocal in expressing their views. It is therefore important to remember that views vocalized may not be representative.

- *Take context into account.* What other public issues are competing for attention? for residents' dollars? Consider how this affects timing and the way you frame your case.

Exercise communication savvy

- *Talk with residents one-on-one*, in senior citizen centers and other social settings, not only to convey information but to elicit reservations and objections, so they can be addressed.

- *Take facilitation and mediation skills as seriously as technical, financial, and legal resources*.

- *Remember that you are literally going into people's back yards.* Unlike a campaign to build support for adopting, for example, a bond issue, building support for wastewater management involves physically investigating homeowners' private property. Homeowners must be approached with sensitivity and respect.

- *Seek local champions.* They can work toward project goals, recruit other residents to participate, and help earn acceptance. Record the name of every individual who expresses interest; record how to contact them; let them know how to contact you. Keep champions informed so they in turn can share the latest information. Meet personally with as many people as possible—and listen to their questions and concerns. Asking them how their neighbors view the project can not only provide valuable information about neighbors' concerns but may indirectly elicit the speakers' concerns.

- *Be mindful of factions*—for example, family antipathies that go back several generations. You can't solve these problems, but you can factor them into your planning for public involvement. And you can be mindful of the possibility that opposition that manifests itself as concern about, for example, cost may mask other issues.

- *Listen strategically and respond.* Throughout the project (1) anticipate questions likely to arise, (2) identify misconceptions, (3) be as attentive to what residents are *not* saying as to what they are saying, and try to elicit and respond to it. The list of questions above is a useful reference here.

- *Don't mistake an orderly process for public acceptance.* Listen harder. Ask questions.

- *Don't assume that because you have distributed flyers and held a meeting that you have communicated effectively*. Listen harder. Ask people how their neighbors view the project.

- *Stage an outreach event;* for example, show a video on wastewater management and follow it with informal commentary by several experts and a question & answer session.

- *Remember that audience composition changes through time.* Because different people may attend different meetings, repeat core messages again and again.

- *Consider expediting the public involvement process by sending controversial messages.* If potential funding will only be available for a limited time, or if contamination may be severe enough to demand immediate action, you may not have the luxury of slowly and steadily building public understanding, involvement and acceptance. Instead, you may want to announce a plan of action and loudly state an estimated cost per household to galvanize—and focus—public debate. Over time, debate about costs may prove constructive and help accustom residents to the prospect of modest monthly fees.

  You may also want to communicate a tougher message at the outset: Residents without adequate septic tank systems are violating state groundwater regulations; this project can help them achieve compliance.

Explain the basics clearly and communicate effectively

- *Help residents understand* (1) the nature of the physical problem, (2) options for physical solutions, (3) options for funding. One-on-one communication is always best. But useful informational materials are available, including videos produced by the National Onsite Demonstration Program that sponsored this case study. Such materials can be obtained through the state Construction Programs Bureau.

- *Avoid a hard-sell.* However convinced the project's sponsors are that the project is essential, the final decision must rest with local residents. They must come to the decision in their own time, and in their own way.

- *Create public information materials of professional caliber.* Use flyers written in a clear, human voice; keep them brief and to the point. Use good design and color as a draw. If you can afford the services of a graphic artist, use one. Create an identity for the project by (1) using a consistent visual signature, (2) using a consistent and positive tag line (like *Keeping Willard's Water Clean*).

- *Publicize meetings heavily and offer inducements.* Over several weeks, distribute several notices for an important upcoming meeting. Enlist help in publicizing meetings. Offer refreshments, a raffle.

- *Plan and conduct meetings strategically*, paying close attention to how the size of the meeting room, its layout, and the meeting agenda can affect meeting dynamics. During meetings, gently encourage people who are silent to join in, so you can learn their views and engage them. To present technical information, rather than lecturing to a group, use table-top displays that offer opportunities for one-on-one exchanges.

> *We must protect our water for our grandchildren.*
>
> The one woman who spoke at a public meeting

- *Clarify and simplify vocabulary*. In written communication and in meetings, use clear terms and use them consistently. For example, EPA rules require a "facility plan." But a decentralized system does not require building a "facility," and there is no need to confuse residents by introducing this term, which has the further disadvantage of suggesting large capital construction costs. Call it "the engineer's report."

- *Be mindful of literacy levels and bilingual needs.*

Use new communication technologies if possible

- *Use the Internet* as an outreach tool and a project management tool. The small rural communities that most need this kind of project are least likely to include many households with Internet access. But e-mail and a Web site can be powerful tools over the entire lifetime of the project. Gaining Internet access warrants an investment up front, if only in the form of one modem and an Internet Service Provider account for the community's computer.

- *Use a digital camera* to document project development. This tool may be worth an investment, too. To promote feelings of ownership, post photos in the town hall; incorporate them into fliers and bulletins; and, if the community has a web site, post them on it.

- *If possible, use geographic information system tools to analyze and display data on baseline conditions and* what-if *scenarios, and as a project management tool.* Within several years small communities may be able to afford GIS; in the meantime, they may be able to use GIS capabilities that belong to someone else. Present GIS displays to the public in the early stages of the project; they are a powerful communication tool that is becoming increasingly widely used. Once the wastewater management system has been constructed and is operating, GIS can be used to track the status of each component of the system, recording inspections performed, and establishing priorities and schedule for pumping tanks.

Be prepared to quit; be quick to celebrate

- *Be prepared to "pull the plug."* If after reasonable effort, residents seem unlikely to make the project their own, abandon it and direct your efforts where they are likelier of success.

- *Celebrate progress.* As soon as a key milestone is met, report the news widely. At key points, issue news releases. When the wastewater management system begins operating, hold a ceremony attended by local, county, and state officials and representatives of environmental and health organizations. This will help reinforce residents' sense of accomplishment.

- *Remember long-term goals.* The project can succeed over the long-term only if residents understand its fundamental importance and are committed to supporting operations and maintenance. As new generations and new residents come along, public education must continue.

APPENDIX D – Summary of Implementation Steps

The steps below were not all taken in strict sequential order, and the time frames are generalized, not formal. But the sequence conveys a rough idea of how the project has evolved.

Project launch phase

Village council agrees to proceed with project.

State Construction Programs Bureau Financial Manager and state facilitator work with village officials and staff to assemble core funding package.

State facilitator enlists RCAC, a public interest group that can provide a bridge loan and technical assistance; he contracts with them to conduct a survey to determine baseline conditions.

Village clerk-treasurer initiates successful request for grant from state Finance Authority, through state representative.

State facilitator drafts RFP for preliminary engineering report.

Village issues RFP for engineering report and places ad in paper announcing RFP.

Residents' advisory committee screens and evaluates proposals from engineering firms.

Village selects engineering firm.

State facilitator drafts contract for engineering report.

Using RCAC bridge loan, village contracts for engineering report.

Formal planning phase

Village adopts ordinance establishing its authority to manage a wastewater utility.

Physical baseline is established: With help from residents, RCAC manages house-to-house survey to gather information on existing systems. RCAC subcontracts field verification of physical condition of existing systems.

Engineer prepares (1) engineering report identifying and assessing technical options, estimating costs, and recommending one option, (2) environmental information document assessing in depth the potential impacts of option recommended.

State facilitator draws on environmental document to draft environmental assessment.

Village holds public meeting to review engineering report and environmental information document.

Village holds public comment period on engineering report and environmental document.

Engineer finalizes engineering report per public comments.

State facilitator prepares environmental assessment, issues it, and after comment period issues Finding of No Significant Impact.

Village submits engineering report to the state, which approves it and sends village documents to authorize loan from Clean Water State Revolving Fund.

Village executes loan documents and adopts ordinance establishing fee for repayment of loan, triggering approval of loan to village and award of EPA grant and state match.

Village authorizes engineer to proceed to design phase.

Design phase

Engineer prepares plans & specifications for construction.

State funding agency reviews and approves plans and specifications.

Village acquires necessary easements.

Village advertises for bid for construction work and awards contract.

Construction: Phase I

Construction begins.

Engineering firm monitors construction and works with contractor to adapt design to field conditions.

Village seeks funding for Phase II.

On recommendation of engineering firm, village will determine if construction is acceptable and complete and if so will make final payment.

Operations and maintenance for Phase I

State bureaus determine permitting requirements; village applies for wastewater discharge permit from Groundwater Quality Bureau.

Village determines how to manage inspections, operations and maintenance, sampling, and pumping.

With cost information in hand, village will determine monthly fee to assess for operations and maintenance.

Village will adopt ordinance establishing its authority to collect maintenance and operations fee and setting amount.

Construction: Phase II

If village receives funding, construction will begin.

When construction concludes, village will amend ordinance increasing monthly fee to encompass the whole system.

APPENDIX E – Sources of Funding and Assistance

The Willard project benefited from a one-time EPA hardship grant that cannot be replicated. But other sources of funding are available. The community guide cited on page 1 of this case study lists many sources and offers contact information.

The primary sources for wastewater projects in New Mexico are the Rural Utility Service, the state Environment Department, the New Mexico Finance Authority, and Community Development Block Grants. Together they offer "one-stop shopping" sessions to help communities learn about available funding. Another source of funding is direct appropriations for specific projects from the state legislature. As a rule, agencies that offer funding can also offer some technical assistance.

Note: Federal funds cannot be used to match federal funds.

Sources of Willard's Funding and Support

Source	Amount	Purpose	Comments
One-time EPA hardship grant State revolving fund loan for 15% match State appropriation for 5% match	$389,700 $63,000 loan $30,000 (Total = $482,700)	Applied to engineering and construction costs.	15% of total EPA grant had to take the form of state loan; 5% had to come from other sources. Award of loan was contingent upon village's adoption of fee schedule to repay loan.
New Mexico Finance Authority	$90,000 grant	$6,000 was used to purchase two parcels of land needed to construct treatment clusters; the balance was use for Phase I construction.	
EPA	$79,000	Demonstration project to produce implementation guide and model ordinances. Included cost of experts on public involvement.	Not applicable to future projects. State contributed $1,000 to obtain EPA grant.
State Construction Programs Bureau	n/a	Technical assistance	.
Rural Community Assistance Corporation (RCAC) bridge loan	[$27,000]	Short-term bridge loan to cover cost of engineering services to develop documents needed for application for EPA grant and state revolving fund loan.	Bridge loan was repaid with state revolving fund loan; did not add to total project cost.

Source	Amount	Purpose	Comments
State Drinking Water Bureau	$20,000	Survey of homeowners and field verification of results.	Drinking Water Bureau provided funds to Construction Programs Bureau, which contracted with RCAC for survey.
Homeowner fees	$3/month for lifetime of project Estimated @$5 for Phase I plus an additional estimated $7 for Phase II and thereafter Total estimated: $8 and $15	Repay state revolving fund loan. Pay for inspection, operation & maintenance, periodic septic tank pumping.	Homeowner fee matters most to residents because they pay it directly.

APPENDIX F – Technical Description of Willard's System

Willard's system employs both individual septic tanks connected to cluster treatment systems and, in sparsely populated areas that are beyond the area that directly affects the well, individual septic tanks with adjacent leachfields.

Each cluster treatment system consists of a recirculating treatment tank, a textile media filter that takes up about one-third the area of a traditional sand filter, and a leachfield. Together these components constitute a bioremediation process; no manufactured chemicals are used.

Effluent entering the treatment tank is subject to an oxygen-deprived environment in which denitrification—the conversion of nitrogen to consumable and volatile forms—can occur. A pump at the opposite end of the tank operates on a timer to dose effluent to the filter pods, which provide an aerobic environment for nitrification—the conversion of organic nitrogen to nitrates. A pipe system distributes wastewater over the filter media for treatment, and an electric fan ensures a constant flow of fresh air to accelerate the treatment process and keep it aerobic. Treated effluent from the filter pods is returned to the inlet end of the recirculating treatment tank. There, a splitter valve routes some of the treated water to the leachfield for dispersal into the soil. It blends the remainder with raw influent from the collection system to undergo denitrification and repeat the process, further refining the effluent by removing nitrogen.

By alternately subjecting effluent to oxygen-starved (anoxic) and oxygen-rich (aerobic) environments, the treatment systems accelerate the process by which nitrates are formed and broken down. By contrast, because effluent discharged directly into a leachfield encounters an anaerobic environment, nitrification-denitrification occurs only slowly and nitrate levels remain high. In both cases, effluent could eventually migrate to the aquifer, but Willard's wastewater system will greatly reduce the levels of nitrates that do reach the aquifer.

Conventional onsite wastewater treatment systems (a septic tank and leachfield) do not provide much opportunity for denitrification because effluent is oxygen-starved and doesn't have the opportunity to absorb oxygen before entering the saturated flow regime of the leach bed. In fact, direct exposure to air is objectionable because it releases hydrogen sulfide and other foul-smelling gases produced by the anaerobic (septic) process. The leachfield itself discharges to soil under saturated conditions; this retains nitrates in soluble form and may transmit them to groundwater. But in sparsely populated areas where total nitrogen loading is low, the effect on groundwater is negligible due to dilution. Thus, in Willard's Zone C, septic tanks and leachfield are adequate.